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POPULATION GROWTH AND LAND USE PLANNING

Prepared for the Task Force
Central Ontario Lakeshore Urban Complex (COLUC)

by
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February 1974

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FOREWORD

Land use planning has become an important element of urban development in Ontario. The Ontario Government's Advisory Committee on Urban and Regional Planning in 1973, approved the establishment of an Inter-Ministry Task Force, for the purpose of preparing a "Structure Plan" for the Central Ontario Lakeshore Urban Complex, commonly known as COLUC. The Mature State Concept was to be based on the policies of the 1970 Toronto Centered Region Plan which were aimed at redirecting and containing urban development. The area under study extends from Hamilton to Oshawa and includes the counties of Wentworth, Halton, Peel, York and part of the counties of Ontario and Durham.

The need to conserve productive land for food production became a debatable issue among the members of the Task Force. Since prime agricultural land is readily available and easy to service there was genuine concern that extra costs should be incurred in preserving land for food production. After all:

> "Canada and Ontario have vast areas of undeveloped agricultural land; North America has always produced a surplus of food; the United States' land banks have millions of acres of idle productive farmland; food production has always outstripped population growth; the cost of preserving agricultural land for food production is too high since prime agricultural land can be serviced much cheaper for urban development, than lower grade soils, etc."

This report "Population Growth and Land Use Planning" is a summary of information on world population, food requirements and production capabilities, with particular reference to Canada and Ontario. A comparison of the food production potential of the COLUC study area is also included. The author has drawn from studies and statements by some of our most advanced thinkers and scholars in his survey of man's predicament. There has been no attempt to forecast precisely, future food requirements and production capabilities for any specific point in time. To emphasize the gravity of the problem, extensive quotes by various world figures and from published studies have been included. Information on population and food production trends has been included in tabular form.

A factor which warrants consideration is the effect of world climatic changes on food production. This aspect of climate has not been discussed in this study. Climatologists suspect that long term changes in climate are taking place. Considerable uncertainty exists about the nature of these new weather cycles and their ultimate effect on food production. There is a possibility that the weather conditions which reduced food production in 1972, could return. In this connection, Professor Kenneth Hare, of the University of Toronto and Director General of research on the environment for the Canadian Government, has made the following statement:

> "I don't believe the world's present population is sustainable if there were more than 3 years like 1972 in a row."

Likewise expressing concern about the uncertainties of the present climatic cycles and their effects on the universe, Tom Alexander, a scientific journalist, in an article in Fortune magazine, February 1974, made the following observation:

> "In writing the equations for mankind's survival, we'd better allow plenty of margin for error."

Summary and Conclusions

Ever since man first learned to cultivate the soil, he has staked out his claim on the land and other non-renewable resources of the universe. He has used these resources to enhance the quality of his life. In the process he has multiplied and his use of these resources has multiplied at an accelerating rate, thereby, according to the most advanced thinkers and scholars of today, assuring his own extinction. Unless there is a drastic change in the course of events, man, suffocating in his own pollution, will die of starvation.

The majority of people are unaware of the critical nature or the magnitude of man's present predicament. This report was compiled to present the views of a wide range of people on this problem. Particular emphasis is directed to land use planning and the need to conserve productive land for food production.

Summary

The COLUC Study Area. The COLUC study area includes 8 percent of Ontario's farmland, and about 11 percent of Ontario's most productive soils; classes 1 and 2. The length of the growing season, which influences crop yields, is as favorable for maximum crop production as anywhere in Canada. The frost free period averages about 160 days compared with 100 near Sudbury and 60 days a few miles out of Edmonton.

According to the 1971 census, 9,200 farmers in the COLUC area, nearly 10 percent of Ontario's total, operated 1.15 million acres of farmland of which 873,000 acres were tillable. They had 11 percent of Ontario's dairy herd, nearly 13 percent of the beef cow herd and over 9 percent of the laying flock. They also produced over 8 percent of Ontario's harvested roughages and cereal grains and from 14 to 16 percent of the potatoes, vegetables and fruits grown in Ontario.

Estimates indicate that at today's consumption levels, the COLUC study area produced sufficient milk for 80,000 people; beef for 330,000, eggs for 1 million and sufficient pork for nearly 1.5 million people. Estimates also indicate that through the wide adoption of improved cultural practices, there is still sufficient farmland in the COLUC area to produce the milk, meat, and eggs required for 800,000 people at present consumption levels. In addition, sufficient fruits and vegetables could be produced for a considerable population.

The COLUC study area has experienced the impact of urbanization more than any other of comparable size in Ontario. Between 1951 and 1971, the number of farms declined by 45 percent, improved farmland by 29 percent and unimproved farmland by 38 percent. During this period the total area of farmland declined by 528,000 acres of which 360,000 acres were improved farmland.

The decline in farmland has accelerated in recent years. Between 1951 and 1966, an average of 15,000 tillable acres were removed from agriculture each year. In comparison, the rate of fall out averaged 26,800 acres per year between 1966 and 1971. At this rate agriculture would completely disappear from the COLUC study area in 30 years. However, if urban development is allowed to sprawl unrestrained throughout the area, viable farming for all practical purposes will cease to exist within 15 years.

As the urban shadow spreads and thickens, the difficulties of farming in an urban community will multiply, services to farmers will disappear and the removal of land from agriculture will accelerate at a much faster rate than experienced in the past few years.

Ontario. In the 30-year period, 1941-1971, Ontario's population increased over 100 percent from 3.8 million to 7.7 million. Conservative estimates indicate that the population will reach 12 million by the year 2000, a 56-percent increase over 1971. At today's productivity and consumption levels, this means a 56-percent increase in land requirements for food production.

During the past 30 years, 6.4 million acres of Ontario's farmland was removed from agriculture. By 1971 there were about 16 million acres of farmland which accounted for 7.0 percent of Ontario's total land area. During this same period the acreage of improved land, composed of class 1, 2, 3, and 4 soils, declined by 2.5 million acres from 13.4 to 10.9 million acres. Improved farmland in Ontario accounts for about 10 percent of the total improved farmland in Canada.

As happened in the COLUC study area, the removal of farmland from Ontario's agriculture has accelerated in recent years. Of the 2.5 million acres of improved land removed from agriculture between 1941 and 1971, 48 percent or 1.2 million acres were lost between 1966 and 1971. In southern Ontario an average of 200,000 acres of improved land per year were removed from agriculture, during the 1966-1971 period. At this rate within 50 years, all of the improved farmland in southern Ontario would have been removed from agriculture. In all probability, long before this, agriculture would cease to exist in southern Ontario, as a viable industry.

The growth of Ontario's population combined with the decline in farmland has reduced the amount of improved farmland from 3.5 acres per capita in 1941 to 1.4 acres in 1971. At present Ontario levels of productivity and consumption, it requires at least 1.7 acres per capita of improved land to produce the amount of meat and livestock products consumed. Probably the equivalent of 1.8 acres per person are required to produce all of the food. With 12 million people by the year 2000, this would mean a total of 21.6 million acres for food production or about double the amount of improved land in Ontario in 1971.

Both productivity and consumption levels have been increasing. Despite the decline in the number of farmers and farm acreages, the index numbers of physical volume of agricultural production increased to 126.3 in 1972 based on 1961 being equal to 100. The consumption of meats increased from 181 pounds per capita in 1960 to 216 in 1971 while the consumption of milk products and eggs declined.

An increase of 100 to 125 percent in crop and livestock productivity by the year 2000, may be neither technically nor economically feasible. However, if a productivity increase of 100 percent were feasible, then it would require about 11.4 million acres of improved land to provide sufficient food for 12 million people allowing for a moderate increase in consumption. If productivity increased by 50 percent and moderate increases occurred in consumption so that 1.27 acres of land per capita were required to produce sufficient food products then 15.2 million acres of improved land would be required for 12 million people.

If on the other hand a productivity increase of 70 percent were achieved so that 1.12 acres of productive land could supply sufficient food for one person then some 13.4 million acres would be required by the year 2000. At our present rate of fall out, productive farmland in Ontario will have decreased to 5 million acres or less by the year 2000. In this situation it would require 6.7 million acres or nearly 2 million more than will be available to grow 50 percent of Ontario's food requirements. Likewise, to produce 75 percent of Ontario's food requirements by the year 2000, over 10 million acres will be necessary. This is equivalent to the amount of improved land presently in Ontario or 5 million acres more than will be available in 2000.

Land in northern Ontario is of a lower quality than the class 1 and 2 soils of southern Ontario. In addition the climate restricts the selection and yields of crops and in livestock production limits the length of the pasture season resulting in higher production costs. New land in northern Ontario brought into food production on a per acre basis would probably produce between one-third and one-half that feasible from the improved land in southern Ontario. In other words, it would require from 2 to 3 acres of tillable land in northern Ontario to replace 1 acre of tillable land in southern Ontario or about 12.5 million to replace 5 million acres.

Even under ideal conditions and with extreme care and efficiency in the use of resources to bring new land into production at today's prices, it would probably cost $100 per acre for farm buildings, close to $400 per acre for clearing drainage and fencing and an additional $100 for machinery and equipment. To this can be added the costs of roads and other services which might cost another $400 to $600 for a total of $1,000 to $1,200 per acre.

At these conservative estimates, a capital outlay of 12.5 billion dollars would be necessary to bring 12.5 million acres into food production in northern Ontario. This capital outlay is equivalent to about $1,200 for every acre of improved farmland in Ontario in 1971, and is also equivalent to $2,500 for each of the 5 million acres which may be removed from agriculture in southern Ontario by the year 2000. Looking at it from another point of view, the replacement costs of the 200,000 acres of improved farmland being removed from agriculture in southern Ontario each year would amount to at least 500 million dollars.

Canada. Canada's population of 22.5 million is expected to double within the next 50 or 60 years even though the annual rate of growth has slowed to about 1.2 percent, compared with an estimated growth of 2.0 percent in world population. Canada's farmland of 170 million acres comprises about 7.4 percent of her total land area. Although the total amount of land in agriculture has decreased slightly, the area of improved land has grown from 92 million acres in 1941 to over 108 million in 1966 and 1971. Despite this upward trend, the improved land per capita declined from 7.9 to 5.0 acres between 1941 and 1971.

Although the yields and total production of cereal crops have increased significantly during the past 30 years, the production per capita has declined by nearly 900 pounds from an average of 4,440 pounds in the 5-year period, 1939-1943, to 3,566 pounds in the 1969-1973 period. Projections indicate that by the year 2000 Canada may continue to have a surplus of cereals and root crops but deficiencies in fruits, vegetables, and oil crops will become larger.

Even with today's population, Canada imports an appreciable amount of meats. For instance, the importation of beef increased from 55.6 million pounds in 1961 to 215 million pounds in 1972 while exports increased from 45.8 to 83.8 million pounds. In addition to importing 15.6 million bushels of soybeans in 1971, Canada also imported 7.9 million bushels of corn, 129 million dollars worth of vegetables and 287 million dollars worth of fruits and nuts.

The myth that Canada has vast areas of productive undeveloped farmland has been exposed. Recent estimates indicate there are about 53 million acres of potentially tillable land which could be brought into production. However, most of this is of lower quality soils, located in remote areas such as in the Great Clay Belt and Peace River districts where climate limits the selection and the yields of crops. The returns may not warrant the high costs of bringing much of this land into agriculture.

Other factors which limit the development of the food potential capacity of Canada include:

(1) An apparent growing shortage of the necessary fossil fuels. For instance at present rates of use, Alberta's known reserves of petroleum, excluding the tar sands, will be exhausted in 15 years.

(2) Huge capital expenditures required to reverse the course of rivers for irrigation purposes.

(3) The high costs of natural gas and conversion of waste heat from nuclear plants will limit greenhouse production to the most high priced foods.

(4) The apparent plateau which has been reached in the development of new high yielding varieties of crops.

The World. Authoritative sources in the late 1940's placed the world population at 3.3 billion by the year 2000. However, this figure, an increase of 1 billion, was reached within 20 years, 30 years sooner than predicted. This case illustrates the uncertainties associated with forecasting and the acceleration in population growth which has taken place within the past 20 years.

Demographers expect the world population of 3.86 billion in 1973 to double within the next 35 to 40 years. Population projections range from an estimated world population of 5.3 to 7.4 billion by the year 2000. However, based on medium growth assumptions, the world population may range between 6 and 6.7 billion.

The growth in population combined with man's drive for a better life have placed a strain on the world's resources. While land is the prime resource for food production, the scarcity of other resources can limit food production capacities.

Vast areas of potential agricultural land (nearly 4 billion acres) are still available for development throughout the world. However, the ultimate development of these lands for agricultural use will be restricted by such factors as accessibility, capital required, production costs, water supply and the availability of other non-renewable resources.

According to surveys conducted by the United Nations, the costs of bringing new land into production have ranged between $215 and $5,275 per hectare.

An increasing demand for fresh water will place an upper limit on how much of it can be used for food production. Shortages in the supplies of nitrogenous and phosphatic fertilizers and in fossil fuels will have a profound effect on food production.

Total food production in the world increased from an index of 100 in 1963 to an index of 126 in 1971. Eastern Europe and the USSR had the highest index (139) while western Europe, North America and the Far East had the lowest (121 and 122). On a per capita basis food production increased faster than population growth in the developed countries. In the developing countries, trends in food production barely kept pace with trends in population growth.

Projections concerning the food production capabilities of the world reflect uncertainties. Some researchers indicate that the present ~~land~~ level of food output can be maintained for the next 30 years. At the same time they are praying that the population growth can be slowed. Others believe that if the per capita land requirements and population growth rates remain as they are today, there will be a desperate land shortage before the year 2000.

Conclusions

A study of the pressures on the world's resources created by man's drive to improve the quality of his life and by an accelerating growth in population has revealed several basic issues related to the conservation of land for food production.

(1) With present technology, the food production capabilities of the world cannot keep pace with an unchecked population growth.

(2) Countries that have large areas of undeveloped agricultural land and where there is a moderate growth in population, such as in the developed countries, will be called upon to provide food to those countries where starvation is rampant.

(3) The recent energy crisis and food shortages resulting in escalating prices, are indications that many of the resources necessary for survival are exhaustible. If we are to retain our present quality of life, we must come to grips with the problems created by the growing pressures on our non-renewable resources including land.

(4) Canada, with a limited amount of undeveloped, relatively low productive land, cannot sustain a population much greater than the 45 million predicted for the year 2030.

(5) Ontario faces the dilemma of a shrinking agricultural land base and a growing population. Should the province rely on food imports which can be affected not only by vicissitudes of nature and disease but also by political decisions or should it produce most of its own food requirements.

(6) For Ontario to rely on other provinces or countries to supply a large proportion of her food requirements, is to lose a measure of control over her destiny and to limit the choice of opportunities for future generations. The tenuous nature of imports has been clearly demonstrated in the recent food and energy crisis. Therefore, the extent to which Ontario can determine its own future will be determined in part by its food production and land use policies. By the year 2000, to provide even 50 percent of the food for a

growing population from a rapidly declining land base, will prove to be a monumental task for the people of Ontario.

(7) In Ontario, agriculture cannot compete for land, with the market forces generated by other sectors of the economy. Therefore, if productive land is to be retained in agriculture, firm policies are required to contain the urban sprawl, presently permeating so much of the rural area.

(8) In the COLUC study area, agriculture is experiencing the full impact of urban development. This area which, if brought to its full potential, could supply enough food for nearly 1 million people will cease to have a viable agriculture in a relatively short time, unless firm policies are implemented to conserve the agricultural land.

(9) An issue of prime concern is whether Ontario should conserve productive farmland near communities and in climatic zones favorable to food production and human habitation or whether Ontario should rely on future food supplies from less productive land, located in remote areas and where the climate significantly restricts not only the selection and yields of crops but also human activities. Which ever decision is taken, the costs are inevitable.

POPULATION GROWTH AND LAND USE PLANNING

Introduction

Man has been struggling for centuries to improve the quality of his life. His first goal was, of necessity, survival, so he struggled to acquire food and shelter. Down through the centuries as he learned how to produce his own food and how to harness the natural resources of the world, man's goals changed.

No longer were all his time and energies needed for mere survival. Production, trade, commerce, and the use of natural resources, have provided man, particularly in the developed countries, with his present-day high standard of living and quality of life.

Many of our resources are of a finite or non-renewable nature: meanwhile, increased food production, together with increased control and prevention of disease, has resulted in a "population explosion." Man's drive for a "better life," coupled with this growing population, has created great pressures on the resources on which he has come to depend: witness the repercussions from the recent "scarcity" of fossil fuels.

> "The planet we live on is finite, and the population which it can support at a reasonable standard of living is likewise finite. One can debate what a reasonable standard of living ought to be, but what is beyond debate is that some two billion individuals of the human race currently are condemned by circumstances to a standard of living that is plagued by poverty, deprivation and indignity. We are not talking about a poverty that is a mere absence of affluence. We are talking about a poverty that is corrosive of human decency, characterised by hunger and malnutrition, high infant mortality, low life expectancy, wide spread illiteracy and chronic unemployment ... social tensions,

> political turbulence and the irrational eruption into violence are the final fruits of unmanageable population pressures. No society, no economy, no government can sustain such pressures indefinitely." [a]

Food and shelter still remain man's basic needs, but productive agricultural land, given our present state of technology, is a non-renewable resource. It is improbable that our capacity to produce food will keep pace with our capacity to produce people. There will inevitably be increased pressures for more agricultural land and for greater productivity on the existing agricultural land.

> "On the food production front we can hold the line for the next 30 years, while hopefully population growth can be slowed, if agriculture is given proper priority and support." [b]

Land once covered by asphalt, is for all practical purposes lost for food production. Consequently, in areas of rapid urban growth such as Ontario and the Central Ontario Lakeshore Urban Complex in particular, to conserve land for future food production, land use policies and plans must include priorities relative to the use of productive agricultural land. However, since food production is a universal problem, such priorities must take into consideration the situation in Ontario, and also the larger national and international situations.

> "We need to focus less on total economic growth and more on specific social problems such as unemployment, malnutrition and illiteracy ... The United Nations must speak for the entire world, bearing always

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[a] McNamara, Robert S., President, The World Bank, as reported in The New York Times, Section 12, April 30, 1972.

[b] Norman E. Borlaug, Nobel Peace Prize, 1970, Director, International Maize and Wheat Improvement Center, Rockefeller Foundation, Mexico.

> in mind that 4 billion people cannot live independently without concern for one another's worlds."[c]

---

[c] Waldheim, Kurt, Secretary General, The United Nations.

The World Situation

Population Growth

The population of the world for centuries increased at a relatively slow rate. However, the rate has accelerated and the time required for the population to double has been drastically reduced. While there are wide ranges in predictions, as to the effects of population growth and the rate of growth, all prognostications indicate that the world population will increase to a significant degree and will be accompanied by corresponding pressures on resources.

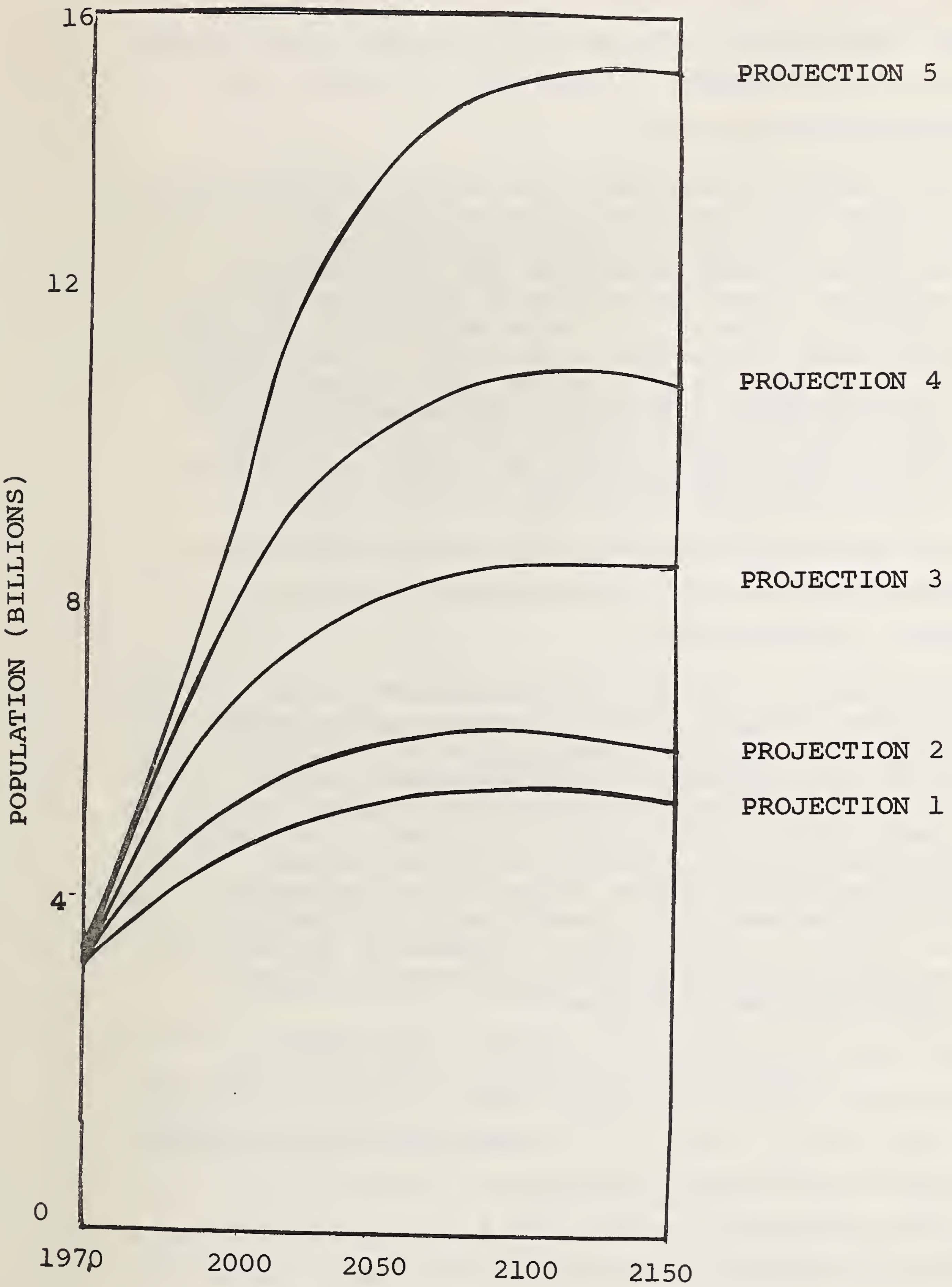
> "Until about 1700 the human population of the world grew very slowly: probably at an average rate of less than .002 percent per year. Now on a world wide basis the rate is 1,000 times higher: 2 percent per year."10/

According to Professor Frejka, University of Toronto, at the present growth rate the population of the world, which is now estimated at about 3.6 billion, would reach "close to 7 billion around the year 2000, 14 billion in the 2040's and 28 billion in the 2070's." However in the past decade the rate of natural increase has been declining in developed countries and is estimated at less than 1 percent per year. In the developing countries, on the other hand, the average rate of natural increase has been estimated at 2.6 percent per year for the late 1960's.

Professor Frekja has developed population projections to the year 2150. His five projections are based on "assumptions about when a net production rate of 1 might be achieved and maintained." In developed countries a net reproduction rate of 1 corresponds to a total fertility rate of about 2.1 which is the replacement fertility (Figure 1).

Based on these five projections and using for the 1970 population an index of 100, by 2050 the index of

FIGURE 1 WORLD POPULATION PROJECTIONS



POPULATION PROJECTIONS are based on five assumptions about when a net reproduction rate of 1 might be achieved and maintained. Reading from the bottom the dates are respectively 1970 to 1975, 1980 to 1985, 2000 to 2005, 2020 to 2025 and 2040 to 2045. With an index of 100 for the 1970 population, the indexes under the five respective projections would rise by 2050 to 153,172,224,287 and 357 and by 2150 to 156,176,230,306 and 416.

Source: Tomas Frejka, The Prospects for a Stationary World Population, Scientific American, Vol. 228, No. 3, March 1973.

population would range from 153 to 357 (Figure 1). By the year 2150, the population index based on the lowest projection would reach 156 compared to 416 for the highest projection.

> "With constant fertility and declining mortality the population of the world could be 7.4 billion in 2000 and close to 30 billion by 2050 ... If a world wide pattern of two children per family on the average - that is, a net reproduction rate of 1 - were reached by 2000 and maintained thereafter, the world's population would be about 8 billion by 2050 but would not grow much more. If a net reproduction rate of 1 was reached gradually by the middle of the next century the population would be 13 billion in 2050 and some 15 billion in 2100."10/

Professor Frejka rejects the proposition that the minimum projections in his population forecasts are obtainable and concludes:

> "To achieve a non-growing population in this century, even in most of the more developed countries, fertility would have to decline significantly below the replacement level. In the less developed countries such an event seems inconceivable during the coming 50 years provided that mortality conditions do not deteriorate and there are no major disasters. The achievement of a non-growing population is likely to take several decades in the most developed countries and many decades in the less developed countries."

The Population Reference Bureau, Inc.[24/] has published population estimates based on United Nations data. According to this information, the world population as of mid-1973 was estimated at 3.86 billion. By 1985 it is expected to reach 4.93 billion and is conservatively estimated to reach 6.5 billion by 2000. Based on these estimates, the population of North America is expected to increase from 233 million to 333 between 1973 and the year 2000. The population of Canada will reach 27.3 million by 1985 and will double from 22.5 million in 1973 to 45 million by about 2030.

A comparison of these projections reveals that the world population is expected to reach between 6.0 and 6.7 billion by the year 2000 according to Professor Frejka's medium and high rates of growth compared to 6.5 billion projected by the United Nations medium estimates.

> "U.N. demographers now estimate that world population in 2000 may be between 5.3 and 7.4 billion. This striking change in the outlook for future population growth has become an important, if not dominant factor in current thinking on the world food problems."4/

A review of literature indicates basic uncertainties and tremendous ranges in the possible levels of world population at the same period in time. To illustrate the effect of imponderables on forecasting population, in the late 1940's authoritative projections placed the world population in the year 2000 at about 3.3 billion. However, this increase of 1 billion people was reached within 20 years, 30 years sooner than predicted.

In conclusion, barring drastic government programs, or some catastrophe, within the next 35 to 40 years we can expect the world population to double.

The World Food Situation

Projections on the world food situation range from forecasts of gloom and doom to optimistic estimates that food production will somehow keep pace with population growth.

> "In recent years, we have had a few experts who express belief that the green revolution finally promises to overthrow that depressing ruler of the world, hunger. But during the same years, other writers have predicted the imminence of a world food crisis, so much so

> that developed countries might have to decide by 1975 which food-short countries to save and which to let starve.
>
> "The world could attain a favorable food production - demand balance in the next three decades ... those who can guarantee that this end can be attained, or that it will be forfeited, with subsequent decades of misery for people, are government leaders in countries of large populations with high birth rates or in countries of large unexploited agricultural resources. Leaders in the former countries have the long-run solution of population in their hands and will deliver it or let it slip through humanity's hands; leaders in the latter countries can provide short-run solutions but, try as hard as they may, cannot extend food supplies to match population growth that other countries do not control."[4/]

The present food shortages and high food prices can be regarded with confident optimism or with pessimism as proof that the calamities of Malthus are at hand. The optimists can say that despite the 1 billion or so increase in population over the past 20 years and despite the adverse weather conditions in many parts of the world during the 1972 crop, people are better fed than they were 20 years ago.

The pessimists can point out that approximately one-third of our present population are under-fed. They can also raise the question of how we can possibly feed double the number of people when critical food shortages occur now as a result of adverse weather conditions and inequitable distribution systems.

The daily hand-to-mouth existence of the world was outlined by Dr. Don Paarlberg[17/] who recently reviewed the present world food situation:

> "Our estimate of 1973-74 consumption exceeds the record world grain production in prospect.

> The projected deficit is small, however, and there were well over 100 million tons of wheat and feed grain stocks on July 1 of this year in the U.S., Canada, Australia and Argentina to make up for it. This analysis, however, assumes individual countries will not build unusually large stockpiles of grain during 1973-74. Even without stockpiling, a draw down in stocks of the major exporting countries may be necessary. On July 1 of this year wheat stocks in the 4 major exporting countries were at the lowest level in two decades. Grain stocks in many other countries such as Brazil, Thailand, India, and South Africa also have been drawn down. Thus, stocks to protect against major crop failures are thin. Nonetheless, these stock levels, combined with projected record world production, are more than adequate to meet estimated consumption."

The possibilities of major crop failures, the same as wars and rumours of war will probably be with us for some time. Dr. Paarlberg outlines some of the major factors contributing to the present decline in food supplies:

> " - Winter kill and then a dry summer cut the Soviet grain crop.
>
> - Drought reduced Argentine and Australian grain production.
> - A below-normal monsoon cut India's grain crop.
> - Drought and typhoons damaged the Philippine rice and corn crops.
> - Peru's anchovy catch failed, thus cutting high protein fishmeal production.
> - African Sahelian countries of Mauritania, Mali, Chad, Senegal, Upper Volta, and Niger suffered their fifth consecutive year of severe drought.
>
> These events together with changes in currency values generated large purchases on the world grain market and placed a

> severe strain on world grain and oilseed supplies. They also were largely responsible for the fantastic increase in U.S. agricultural exports from $8.1 billion in FY-1972 to $12.9 billion in FY-1973. Grains accounted for over half the total value increase and soybeans for a fourth."17/

Major crop failures due to abnormal weather conditions are not the only matters of concern for future food production.

> "The misfortunes experienced in Asia highlight the problems of applying the improved technology rapidly enough to increase output sufficiently to keep up with population growth. One of the main limitations is inadequate supplies of the required production inputs; fertilizer, irrigation, pesticides, good land preparation, high quality seeds, and management."17/

During the past decade, world food production has been on the increase. Using 1963 as a base, production has grown from an index of 93 in 1960 to 126 in 1971 or a total of 33 percent (Table 1). The highest increase occurred in Eastern Europe and the USSR where the index of production reached 139. In comparison, Western Europe and North America had the lowest rate of growth in total food production with indexes of 121 and 122 respectively.

The rise in total world food production was accompanied by a faster rise in world population. Again using 1963 as the base year, world food production per capita increased from an index of 99 in 1960 to 108 by 1971 for an overall increase of 9 percent compared with a 33 percent increase in total food production (Table 2).

The slower population growth in Western Europe and North America is reflected in the data. Although these regions had the lowest rate of growth in total production, on a

Table 1 .— World Summary Index Numbers of Total Food Production, by Regions

Regions	1960	1961	1962	1964	1965	1966	1967	1968	1969	1970	1971
				1963 = 100							
World[a]	93	95	99	104	104	110	114	118	119	122	126
Africa	93	93	97	100	102	104	109	112	114	118	124
America, North	93	92	95	101	103	107	112	113	113	111	122
America, Latin	88	93	96	103	106	109	115	116	121	125	125
Asia:											
Near East	90	92	100	104	106	110	115	120	122	124	127
Far East	92	96	97	103	100	101	107	113	117	122	122
Europe:											
Eastern and USSR	100	102	104	112	110	125	126	133	130	137	139
Western	94	93	99	101	101	104	111	113	113	116	121
Oceania	86	89	98	106	99	115	104	126	120	120	125

[a] Excluding China.

Source: Food and Agriculture Organization of the United Nations (FAO), 1972.

Note: The food production index includes the following commodity groups: cereals, starchy roots, sugar, pulses, edible oil crops, nuts, fruit, vegetables, wine, cocoa, livestock and livestock products.

In order to avoid double counting of the production within the agricultural sector, deductions are made for agricultural commodities used in the agricultural production process; they include livestock feed, i.e., agricultural products fed as such and semi-processed feed such as oilcakes and bran. In addition, to the extent that adequate estimates are possible, allowances are also made for imported feed, as well as for seed and production waste. The index numbers are computed by a Laspeyres type formula, applying average regional wheat relative prices as weights. The regional wheat relative prices are weighted by the country production of the commodities concerned. The national wheat-relative prices consist of the national producer prices of the commodities concerned expressed as a percentage of the national producer price of an equal weight of wheat. In most cases, the prices represent averages of producer prices for the 1961-65 period.

For further information see the Production Yearbook published by the FAO and the Supplement to the United Nations Statistical Yearbook and Monthly Bulletin of Statistics.

Table 2 .— World Summary Index Numbers of Per Capita Food Production, by Regions

Regions	1960	1961	1962	1964	1965	1966	1967	1968	1969	1970	1971
				1963 = 100							
World[a]	99	99	101	102	100	104	105	107	105	106	108
Africa	100	97	99	98	97	97	99	99	98	99	101
America, North	98	95	96	99	101	103	107	106	105	102	111
America, Latin	96	98	98	100	100	100	103	101	102	103	100
Asia:											
Near East	97	97	103	102	100	102	103	105	104	103	102
Far East	99	100	100	101	96	94	97	100	101	103	101
Europe:											
Eastern and USSR	104	105	105	110	108	122	121	126	122	128	129
Western	97	95	100	100	100	101	107	108	108	109	114
Oceania	92	92	100	103	95	108	97	115	108	105	108

[a] Excluding China.

Source: Food and Agriculture Organization of the United Nations (FAO), 1972.

For further information see the Production Yearbook published by the FAO and the Supplement to the United Nations Statistical Yearbook and Monthly Bulletin of Statistics.

per capita basis, Western Europe had almost the highest rate of increase with an index of 111 in 1971 (Table 2). By comparison, food production barely kept pace with population in Africa, Latin America and Asia where the index of food production per capita ranged from 100 to 102.

Most projections indicate that, barring unforeseen catastrophies, the world production of cereal grains will continue to outstrip requirements for the next 30 years. However, if production is to meet requirements, dramatic increases in production are required.

> "If average per capita availability of cereals is not to decline to the year 2000, a 110 percent in cereal production over the 1960 level is required.... The 30 million tons of surplus wheat under conforming changes in dietary habits could readily meet the 20 million ton rice deficit."4/

The World's Supply of Agricultural Land

On a world-wide basis it is only now that man has to come to serious grips with the question of land use and food production. In the past the supply of arable land seemed inexhaustible. For instance almost before the pinch for agricultural land began in Europe, North America became the world's reserve granary of food. The additional land of the new world combined with technological developments in plant and animal breeding, machinery and equipment, and the use of commercial fertilizer, disease and weed-control measures, which resulted in a higher output per acre and per man, have created an aura of limitless food surpluses for the past 200 years.

Vast areas of potential agricultural land are still available for development throughout the world. However, the ultimate development of these lands for agricultural use will be restricted by such factors as accessibility, capital required, production costs, water supply and the availability of other non-renewable resources.

> "The primary resource necessary for producing food is land. Recent studies indicate that there are at most, about 3.2 billion hectares of land (7.86 billion acres) potentially suitable for agriculture on the earth. Approximately half of that land, the richest, most accessible half, is under cultivation today. The remaining land will require immense capital inputs to reach, clear, irrigate or fertilize before it is ready to produce food. Recent costs of developing new land have ranged from $215 to $5,275 per hectare. Average cost for opening land in unsettled areas has been $1,150 per hectare. According to an F.A.O. report, opening more land to cultivation is not economically feasible even given the pressing need for food in the world today.
>
> "There are other possible limits ... second in importance only to land is the availability of fresh water. There is an upper limit to the fresh water run-off from the land areas of the earth each year and there is also an exponentially increasing demand for that water."14/

Of particular concern in the immediate future is the supply of nitrogenous and phosphatic fertilizers. Investment in fertilizer plants has not kept pace with demand. There is a growing shortage of natural gas, the principal component of nitrogenous fertilizers. World-wide phosphate rock mining has lagged. Many countries are purchasing more fertilizers to make up for the gaps in food production caused by adverse weather conditions. This combined with devaluation of the dollar has created a greater world trade and has resulted in an all-time low of fertilizer inventories.

However, in the long term, (to year 2000) the supplies of fertilizers are estimated to be adequate for crop production if plant facilities keep pace with requirements.

The availability and the cost of other non-renewable resources such as fuels and metals will also influence the production of food.

> "How many people can be fed on this earth? ... The answer depends on the choices society makes among various available alternatives. There is a direct trade-off between producing more food and producing other goods and services needed or desired by mankind ... Even if the choice were consistently to produce food as the first priority, however, continued population growth and the law of increasing costs could rapidly drive the system to a point when all available resources were devoted to producing food, leaving no further possibility of expansion.
>
> "Of course, society will not be suddenly surprised by the "crisis point" at which the amount of land needed becomes greater than that available. Symptoms of the crisis will begin to appear long before the crisis point is reached. Food prices will rise so high that some people will starve; others will be forced to decrease the effective amount of land they use and shift to lower quality diets. These symptoms are already apparent in many parts of the world. Although only half the land is now under cultivation, perhaps 10 to 20 million deaths each year can be attributed directly or indirectly to malnutrition.
>
> "Even with the optimistic assumption that all possible land is utilized there will still be a desperate land shortage before the year 2000 if per capita land requirements and population growth rates remain as they are today."14/

In a recent address to the Canadian Agricultural Outlook Conference held in Ottawa in January 1974, Mr. A.G. Leeks, Chief, Basic Foodstuffs Service, FAO Rome, has summarized the complexity of the problem of food production and plans that are required on an international basis, even now, to ensure a more stable supply of food.

> "The present world food shortage ... originated through a combination of short-term events being superimposed on longer-term trends. But this has now been joined by radical economic changes, arising outside the agricultural sector, whose consequences for agriculture cannot yet be fully assessed. The medium-term food outlook, therefore, has never been so unpredictable and potentially so unstable. As a safeguard against these uncertainties, we shall need a more systematic world food security policy and a closer coordination of national adjustment, food aid, and stock policies."

Further Statements of Concern about Population Growth and the Demand for Resources[a]

The effects of population growth on the quality of life and on the demands for resources have been expressed by various people and organizations throughout the world.

(1) William H. Draper, Jr., Honorary National Chairman Population Crisis Committee U.S. Commission on Population Growth and the American Future.

> "Even in the richest country of the world with vast acres of arable land, the quality of life will suffer if the total population continues to grow ... A world of 7 billion people, which demographers project for the year 2000, will not bring power to anyone, only increasing poverty with national and international turmoil."

(2) Norman E. Borlaug, Nobel Peace Prize, 1970, Director, International Maize and Wheat Improvement Center, Rockefeller Foundation, Mexico.

> "The affluent nations, in most cases, draw heavily on many of the "non-renewable" resources of the underdeveloped nations for their continued economic development. The affluent nations, thereby, inadvertently contribute to widening the gap between rich and poor nations. It is, therefore, obvious that the affluent nations cannot continue to remain aloof and isolated from the problems of the developing nations ... The basic moral and survival issue for mankind for the next several generations is to find a way to assure that all who are born into this world will have an opportunity to acquire the basic necessities for a decent life. Unless this is achieved, there will be increasing numbers of national and international social and political disorders - with world civilization on jeopardy - as biological man competes for the basic necessities of life. There will be no peace ... On the food production front we can hold the line for the next 30 years - while

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[a] As reported in The New York Times, Section 12, April 30, 1972.

hopefully population growth can be slowed - if agriculture is given the proper priority and support."

(3) Jaime Zipper, M.D., Professor of Physiology, University of Chile Medical School, referring to family planning in China.

"Family planning was introduced in China by Chairman Mao to guard against catastrophe and to facilitate national planning. It will greatly influence future generations of Chinese and the prosperity of the entire nation."

(4) Ferdinand Marcos, President of the Philippines.

"The population of the Philippines today is 38 million and is growing at the rate of 3.4 per cent a year. If this rate of growth continues, by the year 2000 there will be about 100 million Filipinos, a population which will be altogether too much for our small country to contain comfortably, and even more of a burden to support.

"Not only would we have to contend with the enormous problems of food, housing, education and health but we would have to face up to the pollution of our air and water, which population conjestion inevitably brings."

(5) Alberto Lleras Camargo, Chairman, Advisory Board, United Nations Fund for Population Activities.

"Fulfilling the needs of the masses of Latin America is the major challenge of the century ... While the national populations as a whole are growing at unprecedented rates, the growth rates of our cities are even greater. Some of these are actually doubling their populations in 10 years. As a result, in spite of financial investment, there has been an increase in unemployment and underemployment and an inadequate provision of schools, hospitals, doctors and housing ... The urgent need of investment ... requires annual capital investment growth rates of twelve to fifteen percent. But purely economic measures, however, are unsatisfactory unless they are incorporated into a total strategy designed to conquer the misery, malnutrition, unemployment and low cultural level of the masses and the hopelessness of the sprawling slums."

(6) Robert K.A. Gardiner, Executive Secretary, United Nations Economic Commission for Africa.

"To say that we in Africa, are at the crossroads is putting it mildly ... With a steady decrease in the death rate and with fertility remaining high, Africa would, from about 1980 onwards, have the highest rate of growth among all the major areas of the world ... The general consensus has been that family planning programs, to be effective, must discard the one-sided approach of offering family planning services only ... The task, as we see it, is to go beyond family planning and to cover the whole area of family welfare."

(7) The late Rev. Martin Luther King, Jr. Nobel Peace Prize, 1964.

"We are natural allies of those who seek to inject any form of planning in our society that enriches life and guarantees the right to exist in freedom and dignity. For these constructive movements, we are prepared to give our energies and consistent support; because in the need for family planning, Negro and white have a common bond; and together, we can and should unite our strength for the wise preservation, not of races in general, but of the one race we all constitute - the human race."

(8) Rev. Theodore Hesburgh, President, University of Notre Dame, Chairman, U.S. Commission on Civil Rights.

"The United States, which represents six per cent of the world's population, annually uses forty per cent of the world's energy. We are blessed with a marvelous continent, the new world, but we complicate our living by having seventy-five per cent of our population on three per cent of our land. It is unthinking to disassociate population problems from land usage."

(9) Kurt Waldheim, Secretary-General,
The United Nations.

"The greatest challenge for the United Nations during the Second Development Decade is to promote peace with justice and, to achieve this end, to improve the conditions of life, for the billions of men, women and children who will inhabit the earth in the coming decades: our goal is not mere survival, but a life of dignity and peace with hope for each new generation ... Increasing productivity alone will neither eliminate the basis of poverty nor spark a transition to low birth rates. What is needed is also a more equitable distribution of this world's goods. We need to focus less on total economic growth and move on to specific social problems such as unemployment, malnutrition and illiteracy ... The United Nations must speak for the entire world bearing always in mind that 4 billion people cannot live independently, without concern for one another's needs."

(10) Recommendations, U.S. Commission on
Population Growth and the American Future.

"Population policy is no substitute for social and economic planning and development. Successfully addressing the population problem requires that we also address our problems of poverty, sex discrimination and minority discrimination, careless exploitation of resources, environmental deterioration, and decaying cities ... population growth is one of the major factors affecting the demand for resources and the impact on the environment in this country ...

This conclusion emerges with particular clarity with regard to water, agricultural land, and outdoor recreation ... In the broadest sense the policies recommended aim at promoting desirable social conditions by increasing opportunities to exercise freedom of choice ...

In order to provide a framework for regional, state, and local planning and development, the federal government should develop a set of national population distribution guidelines. In order to ease the problems created by population movement, we should develop programs for human resource development, counseling and assistance on worker relocation, and a growth center strategy to promote job opportunities in depressed areas. In order to facilitate the accommodation of population movements, we need comprehensive planning on a metropolitan and regional scale which could be facilitated through greater public control over land use and the establishment of state and regional planning agencies and development corporations."

Canada

Population Growth

Canada's population increased at a slightly faster rate than the world population during the past 2 decades. In 1951 there were 14.0 million people in Canada compared with 21.6 million in 1971, an increase of 54 percent (Table 3). However, the annual rate of growth in Canada has slowed down to 1.2 percent compared to an estimated growth of 2.0 percent in world population. According to United Nations' estimates, Canada's population of 22.5 million in 1973 is expected to reach 27.3 million by 1985 and 45 million by about the year 2030.

Food Production and Consumption

The growing affluence of Canadian society has been accompanied by higher incomes and changes in food consumption patterns. Food consumption patterns indicate that Canadians are becoming extensive users of agricultural land. Estimates indicate that Canadians get over 60 percent of their protein requirements from livestock. In some of the developing countries protein intake is at a much lower level than in Canada and the greater proportion is derived from plant foods.

Increased consumption combined with a growing population has changed Canada's position from that of a surplus producer of agricultural products to a situation where the domestic consumption of meats, fruits, and vegetables is greater than domestic production.

Personal disposable income in Canada has more than doubled from an average of $1,400 per capita in 1961 to $3,400 in 1973 (Table 4). During the same period, expenditures on food almost doubled from $343 to $671 per capita. However, the proportion of disposable

Table 3 .— Population of the World, Canada and Ontario, 1941 to 1973

Year	World millions[24]	Canada ('000)[a]	Ontario ('000)[16]
1941	2,265	11,507	3,788
1942		11,654	3,884
1943		11,795	3,915
1944		11,946	3,963
1945		12,072	4,000
1946		12,292	4,093
1947		12,551	4,176
1948		12,823	4,275
1949	2,368	13,447	4,378
1950		13,712	4,471
1951	2,434	14,009	4,598
1952	2,468	14,459	4,788
1953	2,508	14,845	4,941
1954	2,658	15,287	5,115
1955	2,691	15,698	5,266
1956	2,735	16,081	5,405
1957	2,795	16,610	5,636
1958	2,858	17,080	5,821
1959	2,937	17,483	5,969
1960	3,000	17,870	6,111
1961	3,078	18,238	6,236
1962	3,114	18,583	6,351
1963	3,216	18,931	6,481
1964	3,295	19,290	6,631
1965	3,363	19,644	6,788
1966	3,431	20,015	6,961
1967	3,456	20,378	7,127
1968	3,490	20,701	7,262
1969	3,552	21,001	7,385
1970	3,632	21,297	7,551
1971	3,706	21,569	7,703
1972	3,782	21,831	7,834
1973	3,860	22,268	7,969

[a] Population to 1971, Census of Canada, published by Statistics Canada; population of 1972 and 1973 - Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, Economics Analysis Branch, Socio-Economic Analysis.

Table 4.— Estimates of Personal Income and Personal Expenditures Per Capita on Food, Canada, 1961-1973

Year	Personal disposable income	Personal expenditure on food	Per capita food expenditure as % of per capita disposable income
	$	$	percent
1961	1,437	343	23.9
1962	1,535	352	22.9
1963	1,608	362	22.5
1964	1,679	378	22.5
1965	1,822	394	21.6
1966	1,973	414	21.0
1967	2,100	437	20.8
1968	2,243	450	20.1
1969	2,407	477	19.8
1970	2,517	501	19.9
1971	2,729	529	19.3
1972	3,036	585	19.3
1973 (Estimate)	3,407	671	19.7

Source: Statistics Canada 13-001.

income spent on food declined from about 24 percent to just under 20 percent.

> "It is clear that population growth will be the major determinant of future Canadian domestic demand, as was true in the United States."4/

The per capita consumptions of meat, eggs, oils and fats have increased, while there has been a decline in the consumption of dairy products and cereals.

Beef consumption increased from 70 pounds in 1961 to over 92 pounds in 1972, pork from 50 to 61 pounds and poultry meats from 31 to over 45 pounds per capita (Appendix Table 1). The consumption of milk products has declined slightly to about 840 pounds per capita in the early 1970's. Most of the consumption of cereals is in the form of wheat flour which averaged 134 pounds in 1961 and 124 pounds in 1971.

Fruits and vegetables have been consumed in greater quantities. The consumption of fruit averaged 237 pounds in 1961 and 253 pounds in 1971, while vegetable consumption increased from 156 to 163 pounds per capita. Despite a decline in the late 1950's the consumption of potatoes exceeded 170 pounds per capita in 1971, an increase of over 14 pounds since 1961 (Appendix Table 2).

During the 1948-1952 period, Canada's slaughterings for livestock and poultry meats exceeded domestic demand. Twenty years later, however, the consumption of beef, lamb and poultry meats had outstripped production.

Beef production increased by 118 percent between the 1948-52 and the 1968-72 periods, while total consumption increased 150 percent. During this period, Canada's production changed from a surplus of about 87 million pounds to a deficit of nearly 50 million pounds (Table 5). To a greater or lesser degree, the same trends occurred in the production of other meats.

While Canada's area of cereal crops (wheat, oats, barley, mixed grain, and grain corn) has fluctuated between 42 and 47 million acres (Appendix Table 3) total annual production has increased from 25.6 million during the 1939-43 period to 38.5 million tons in the 1969-73 period (Appendix Table 4). Production of these crops increased from an average of 1,200 to 1,800 pounds per acre.

Table 5 .— Total Production and Total Consumption of Meats in Canada, Average for 1948-1952, 1968-1972, and 1972

Product	Years	Total production	Total consumption	Production minus consumption
		'000		
Beef	1948-52	842,204	754,924	+ 87,280
	1968-72	1,839,489	1,889,062	- 49,573
	1972	1,898,328	2,021,724	-123,396
Veal	1948-52	121,502	243,549	-122,047
	1968-72	102,488	101,672	+ 816
	1972	80,525	83,892	- 3,367
Mutton and lamb	1948-52	34,282	33,658	+ 624
	1968-72	18,644	85,731	- 67,087
	1972	19,850	101,521	- 81,671
Pork	1948-52	899,985	820,097	+ 79,888
	1968-72	1,309,556	1,271,791	+ 37,765
	1972	1,392,907	1,335,624	+ 57,283
Offal	1948-52	77,284	72,408	+ 4,876
	1968-72	123,345	84,409	+ 38,936
	1972	127,023	88,550	+ 38,473
Canned meat	1948-52	70,849	55,354	+ 15,495
	1968-72	131,407	154,877	- 23,470
	1972	-	-	-
Total poultry[a]	1948-52	260,690	251,943	+ 8,747
	1968-72	702,875	703,528	- 653
	1972	981,083	992,816	- 11,733

[a] Total poultry includes chicken, fowl, turkeys, geese and ducks.

Source: Handbook of Food Expenditures, Price and Consumption by Zuhair A. Hassan, Economics Branch Publication, Agriculture Canada, 1973.

In most years wheat accounted for more than one-half of the cereal crops grown in Canada. While the acreage of oats declined sharply, there was a substantial increase in the acreage of barley and mixed grain. Grain corn had the highest rate of growth, increasing from an annual average of 244,000 acres in the 1966-1968 period to an average of 1.2 million acres in 1969-1973.

The change in acreages of cereal crops was accompanied by a change in output per acre. Considering the 10-year average yields for 1939-1948 and for 1964-1973, yields of cereal grains increased by 52 percent or by about 570 pounds per acre during the 25-year period. However, the increase in output per acre was different for the various crops wheat had the lowest increase while grain corn had the highest. The average yields of wheat increased by more than 400 pounds, (40 percent) from about 1,050 pounds to 1,465 pounds per acre (Table 6). Corn yields increased by nearly 2,200 pounds (93 percent) from an average of 2,330 pounds to over 4,500 pounds per acre. Oat yields increased by 570 pounds and barley by 645 pounds per acre.

Despite the increased output per acre and changes in acreages, the production of cereal grains did not keep pace with the growth in population. The total production of all cereal grains declined from an average of 4,015 to 3,560 pounds per capita between the two 10-year periods, 1939-48 to 1964-73 (Table 7). The production of wheat, the main cereal grain, consumed directly by Canadians, declined over 300 pounds from 2,050 to 1,745 pounds per capita, during the same 25-year period.

Table 6.— Trends in Yields per Acre of Cereal Grains by 5-Year Periods, Canada, 1939-1943 to 1969-1973

Period	Wheat	Oats	Barley	Mixed grain	Grain corn	Total production
			pounds per acre			
1939-43	1,148	1,126	1,294	1,358	2,219	1,174
1944-48	947	1,021	1,097	1,484	2,446	1,013
1949-53	1,233	1,289	1,383	1,662	2,673	1,295
1954-58	1,159	1,260	1,518	1,664	3,247	1,288
1959-63	1,182	1,418	1,375	1,762	3,738	1,307
1964-68	1,351	1,583	1,683	1,907	4,619	1,516
1969-73	1,576	1,707	1,979	2,011	4,402	1,811

Source: Census of Canada.

Table 7.— Trends in per Capita Production of Cereal Grains by 5-Year Averages, Canada, 1939-1943 to 1969-1973

Period	Wheat	Oats	Barley	Mixed grain	Grain corn	Total production
			pounds per capita			
1939-43	2,302	1,281	651	156	50	4,440
1944-48	1,802	993	603	143	48	3,589
1949-53	2,318	1,006	739	177	70	4,310
1954-58	1,646	773	683	160	102	3,364
1959-63	1,670	736	479	142	93	3,120
1964-68	1,988	616	604	153	187	3,548
1969-73	1,500	550	1,086	181	249	3,566

Source: Census of Canada.

Various projections have been made about Canada's production of food which indicate that by the year 2000, Canada will continue to have a surplus of cereals and root crops but the deficiencies in fruits, and vegetables, and oil crops will become larger (Appendix Tables 5, 6, and 7).

> "Under assumptions of medium population growth and constant per capita income ... cereal production advances well above demand by 1985

> and the production surplus is projected to double the 1960 level. However, in the succeeding 15 years, demand increases 32 percent while projected production rises about 15 percent. Thus the rising cereals production surplus projected for the 25-year period, 1960-85, levels off and then falls slightly between 1985 and 2000 as domestic demand catches up. With medium population growth and continued income increases, Canada's cereals surplus in 2000 is estimated to be only about 2.3 million tons greater than in 1960. In the same 15-year period, production deficits for raw sugar and fruit and vegetables increase ...
>
> "To summarize, the projections for Canada indicate that production will keep pace with domestic demand for the most part. Maintenance of Canada's traditional role as a grain exporter seems likely, though rapid population and income growth at home could limit export expansion."4/

Farmland and Limits to Food Production

The total area of farmland in Canada remained constant at about 174 million acres during the 1951-1966 period and accounted for 7.6 percent of Canada's total land area. A decrease of about 4 million acres occurred between 1966 and 1971. However, the area of improved land increased from 92 million acres in 1941 to 108 million acres in 1966 and 1971 (Table 8).

The burden of producing more food is falling on fewer and fewer people. The farm population of 3.2 million in 1941, which comprised 27 percent of the total population, declined to 1.5 million in 1971, and accounted for 7 percent of the total population (Table 8). During this period, farms increased from 237 acres to 463 acres per farm while improved acreages increased from 125 to 295 per farm (Table 9).

Table 8.— Trends in Population, Number of Farms, Farmland and Improved Farmland, Canada, 1941-1971

Year	Total population	Farm population	Total number of occupied farms	Total farm-land acres	Improved land acres
1941	11,506,655	3,152,449	732,832	173,563,282	91,636,065
1951	14,009,429	2,911,996	623,091	174,046,654	96,852,826
1956	16,080,791	2,746,755	575,015	173,923,691	100,326,243
1961	18,238,247	2,128,400	480,903	172,551,051	103,403,426
1966	20,014,880	1,960,365	430,522	174,124,828	108,154,377
1971	21,568,311	1,489,565	366,128	169,668,614	108,148,877

Source: Census of Canada.

Note: Total land area of Canada - 2,278,552,320 acres.

Table 9.— Trends in Farm Size and Acres of Improved Land per Capita, Canada, 1941-1971

Census years	Average acreage per farm	Average acreage per farm improved land	Average number of acres improved farmland per capita in Canada
1941	236.8	125.0	7.9
1951	279.3	155.4	6.9
1956	302.4	174.4	6.2
1961	358.8	215.0	5.6
1966	404.4	251.2	5.4
1971	463.4	295.3	5.0

Source: Census of Canada.

While Canada is expected to maintain its surplus position in the production of cereal grains until the year 2000, indications are that the pressure for farmland for food production is bound to increase. Data already presented indicate that while the acreage of cereal grains fluctuated somewhat, total production and the production per acre has increased during the last 25 years. The data also show, however, that on a per capita basis the production of cereal grains has decreased. In meat production, Canada has moved from that of a net exporter to a net importer. To compound these trends, improved land per capita has declined from 7.9 acres in 1941 to 5.0 acres in 1971 (Table 9).

Estimates indicate that Canada has an additional 53 million acres of tillable land which could be brought into production. However, due to inaccessibility and severe weather conditions, the returns may not warrant the high costs associated with bringing much of this land into production.

Dr. C.F. Bentley, Department of Soil Science, University of Alberta, recently outlined the limitations and difficulties associated with expanding Canada's food production:

> (1) Much of the 53 million acres now undeveloped which could be brought into production consists of the lower grade soils and is remote from existing settlements, as in the Great Clay Belt and in the Peace River districts. In the past, attempts to develop livestock production in both these regions have either failed or experienced, at best, moderate success.
>
> (2) Climatic limitations to increased food production are significant. For example, just a few miles from Edmonton, the frost free period averages about 60 days (in contrast to 160 days in the COLUC area). The shorter the time to maturity, the lower the yields. In addition to the high risk of frost, there is the high risk of inclement weather in harvest time.
>
> (3) The production of feedgrains for livestock production may not be justified, due to the scarcity of the necessary fossil fuels. Excluding the tar sands, at present rates of use Alberta's proven reserve of petroleum will be exhausted in 15 years.
>
> (4) Increased food production in greenhouses, which depends on natural gas, will be

minimal as proportion of the total. The use of waste heat from nuclear plants requires much engineering and would be feasible only for high priced food.

(5) The aquatic production of food is not feasible since Canadian waters are too cold to give high production.

(6) Without huge expenditures on the diversion of rivers, only a small increase in food production can be expected from irrigation. In addition many Canadians do not like irrigation farming because the work is too arduous.

(7) To intensify food production by high levels of labor input may not be feasible, since Canadians will not do it. However, food production could be increased in this manner through immigration from other countries, where people are willing to do this kind of work.

(8) Vast areas of organic soils in Canada cannot be brought into production because of low fertility and the limiting factors of weather.

(9) Food substitutes will not attain much commercial significance in relation to vital needs.

(10) Canadians are spending slightly less than 20 percent of their disposable income on food. Unless they are prepared to spend a considerably higher proportion, much of the potential arable land will not be brought into food production because of the high costs of development and the costs of maintaining a viable agriculture in remote areas.

Dr. Bentley also exploded another myth, that Canada can remain an oasis in a desert of starving millions. He indicated that if drastic measures are not taken to limit population growth, Canada may be forced by world opinion to accept millions of people from other countries. Although their standard of living would be much lower than that which Canadians enjoy today, it would be considerably higher in Canada than in their own countries. The general level in Canada would also be lowered.

Canadian Task Force on Population, Man and Resources Programme, Canadian Council of Resource and Environment Ministers, October 1973

The question may be raised as to what may happen in Canada after the year 2000 or how large a population can be supported in Canada without severe reductions in the quality of life. The following excerpts were taken from the final report of the Canadian Task Force on Population:

The Myth of Zero Population Growth in Canada

> Population stabilization is that point at which population neither grows nor decreases in size. Many Canadians believe that because the fertility rate has reached "replacement" our population has stopped growing. This is NOT TRUE. Immigration still exceeds emigration but even if this were not so, the fertility rate would have to remain at the present low rate for many years until the "baby boom" women are through their reproductive years - and that will take the next fifty years.

The Myth of Wide Open Spaces

> Canada's apparent low population density is misleading since most of this country is unsuited for supporting large populations. Further, the impression most Canadians have of their country is obtained in the summer holiday period when freezing temperatures, wind and snow and the problems of food, heat, shelter, clothing and waste disposal is far from anyone's mind. The countryside that could support a large population from May through September would be completely unsuitable for that same group of people for the rest of the year.
>
> Roughly 50 per cent of Canada is underlain by continuous or discontinuous permafrost and large portions are muskeg. The northern areas can support human habitation but to

maintain the Southern way of life, this would entail considerable economic expense and high levels of energy use. In addition the harsh climate and winter darkness contribute to increased psychological stress.

The lack of precipitation in the southern prairies and the arctic (essentially deserts) and the extremes of temperature in most of Canada, both heat and cold, place stresses on all living systems from microbes through to the higher plants and animals, and slow their growth rates. These two factors dictate that waste must be treated very carefully using more energy, that damage takes much longer to correct, and that resources are not as renewable as in milder climates where growth rates are faster. Mosquitoes and black flies are also significant factors with respect to inhabitability.

Canada, the second largest country in the world, has a surface area of 3.8 million square miles and a population density of 5.8 persons per square mile. This compares with an average world population density of 65 persons per square mile in 1967.

It habitable land is estimated as a strip 200 miles wide and 3,223 miles long (from easternmost of westernmost points) then habitable area is approximately 645,000 square miles from which must be subtracted water, mountainous and arid areas. This is less than one-fifth of the area that the myth of "wide open spaces" is based upon.

Given these considerations, it is clear that Canada though sparsely populated, is so by the dictates of available moisture, soil, sun and heat, and by long and severe winters.

Canada and the Global Situation

Agriculturalists in Canada have estimated that at the maximum sustained level, Canada might be able to support 60 million people. This estimate has been questioned, especially in view of prospective depletion of the present subsidy to agricultural production from fossil fuels and mineral ores. Thus, we cannot be expected to feed a very large portion of the world's 3.5 billion (and still growing). Further, although we appear to have spaces which should be "filled," the degree to which immigration to Canada could relieve population pressures is insignificant if it is recognized that in India alone there are estimated to be 200 million people who do not have enough to eat.

Adverse weather conditions are capable of causing food shortages and famine. In spite of advanced agricultural techniques, man has not learned to control climate which determines largely how much habitable land can in fact be used.

Relative to the population pressures felt by many countries (all with more moderate climates) Canada's population problems are not yet severe. But a major question has yet to be answered. What role will Canada and Canadians play in dealing with the global aspects of the population problems? There is no doubt that we have already had substantial impacts (in conjunction with the efforts of other countries) both for the good and the bad. Programmes for the reduction of death rates through reducing infant mortality and death from malaria and starvation have had the effect of increasing global population. Major problems arise where there is a lack of capital to develop the technology necessary to feed, shelter and educate these growing populations. Trade patterns, availability of markets, and balance of payments are major factors in increasing the gap between rich and poor nations. However, Canada has consistently supported the rich nations against the poor in such international bodies at GATT and UNCTAD (General Agreement on Tariffs and Trade, and United Nations Committee on Trade and Development.

Canadians cannot continue to ignore the fact that they are part of the "global village" but much careful thought is required to determine which policies involve the least economic and cultural imperialism.

We must encourage significant efforts, such as that of the International Development Research Centre, the Canadian International Development Agency, the UN and the International Planned Parenthood Federation, directed toward dealing with global population problems. These agencies are the routes through which all of Canada's foreign aid is currently directed.

The following recommendations have been made in respect to Canada's International relations.

(1) The federal government should make a clear statement of position on population and immigration for the World Conference on Population 1974.

(2) Canadian foreign aid should be increased to between 2-3 per cent of the GNP and that a major portion of that be directed towards the solving of problems of over-population.

Population Distribution: The Problem of Urban Concentration

Most Canadians live within 100 miles of the Canadian-American border. More and more will be living in major metropolitan areas if published projections prove to be correct. In 1971, 76.1 per cent of all Canadians lived in urban areas, 64 per cent in urban areas with population greater than 10,000. It has been predicted that by 1981 this figure will rise to 85 per cent and by the year 2000, 94 per cent. In fact 7.8 million Canadians live on 2,418 square miles (five major census areas are Montreal, Toronto, Vancouver, Winnipeg and Ottawa-Hull).

At present there is very little work in progress in Canada to determine the major forces causing urbanization. Whether intentionally or not, many government policies, such as these related to employment, agriculture, transportation, communication and the provision of services (especially health, welfare and education) have had and will continue to have an impact on urbanization.

Among the adverse effects of increased urbanization is the fact that often the land consumed by urban expansion is valuable agricultural land. Because the land in southern Ontario and in the valleys of British Columbia is valuable but limited, comprehensive land use planning is essential.

Increasing concentrations of people make it difficult for the environment to absorb wastes produced. The fact that assimilative capacity is often exceeded makes for difficult urban environmental problems. In addition there are high social costs associated with rapid rates of urbanization. This includes an increase in crime rates, psychological alienation of people divorced from natural surroundings, increased drug problems and alcoholism, and increased incidence of mental breakdown. In addition, in a rapidly growing urbanized area, the increases in per capita consumption of public and social services are far greater than linear, that is, aggregations of people cost more in services than the cost added by each individual because of the emergent and expensive costs of group urban life.

The trend to urbanization also means that smaller towns and rural areas suffer economically and culturally. Statistics Canada data shows that between 1966 and 1971 the number of rural residents decreased in all provinces except Prince Edward Island, Nova Scotia and the Northwest Territories. At the same time the total population in Canada increased from 20 to 21.6 million. Saskatchewan in particular has suffered from this trend.

The concern about urbanization was noted by all Regional Working Groups that submitted reports to the Task Force. Even those regions not concerned with the actual size of the population (i.e. Manitoba, New Brunswick) deplored the fact that much of its population seemed to be concentrating in urban areas at the expense of both urban and rural areas. Special problems of northern areas in maintaining an acceptable quality of life was emphasized by the Manitoba Regional Working Group.

Therefore it is recommended that the following be taken into consideration:

(1) Federal and provincial governments should establish programmes to discourage the further growth of urban areas.

(2) Policies should be instituted to reverse the de-population of small towns and communities.

(3) Governments should encourage the development of new communities, comprehensively planned with respect to location and mix of complementary industry and greenbelts.

(4) Policies must be developed to encourage the retention of Class 1 and 11 land for agricultural use. Suggested methods are relocations subsidies, transportation subsidies and the assignment of the true total cost to industries wishing to expand or relocate in prime agricultural land, a practise which is not to be encouraged Growth patterns set by larger centres should not necessarily be applied to the less dense and more rural oriented centres.

(5) Since there is an imbalance between the pressure of development and the provision of necessary services and amenities in large urban centres, governments at all levels should adopt a policy of correlating growth in cities with urban planning and provision of services.

(6) Research is needed to determine the total desirable population by area in Canada, to study alternative ways of providing housing and to develop new housing.

(7) The development of overall land use policy, by area, is needed.

(8) Programmes are needed to improve the quality of life in rural, small town and northern areas to retain people in them.

Conclusions of the Canadian Task Force on Population

The consequences of population growth are numerous and complex. Since Canada's life support system is finite, the size of its human population will eventually be limited by the capacity of the environment to with stand the impact of technology and or the availability of resources man needs for survival. The sustainable carrying capacity of Canada is not known in detail, but the energy subsidy necessary at present indicates that it may well be less than in is now.

Therefore we recommend that Canada should formulate as quickly as possible, a population policy at the federal and provincial levels which would move toward stabilization. To this end a Royal Commission on Population should be set up to report very quickly. Subsequently a permanent Population Council should be established.

The goal of a population policy would be to achieve a balance between the national, economic and social consequences of Canadian life, one not necessarily based on the assumption of continuing growth and international competition.

As well, such a policy should take into consideration both goals and the means used to achieve those goals. Thus it must address itself to the following: the urgency of the population problem given the long lead-time between initiation of action and its demographic effect; the importance of individual responsibility and freedom in Canada; the impact of direct and indirect measures instituted by both public and private sectors. However, it is essential that those in positions of power be aware of the need not to become entangled in side issues which will obscure the basic issue, the crisis in growth. That this is a crisis must be brought to the attention of the Canadian people through firm policy goals and education on population issues.

In addition to such education programmes we recommend more research into the following: the effects of population density; both overcrowding and isolation, migration patterns, immigration policy and its effects; fertility behaviour; economic policy and population projections; land use and management; resource use and management; policies needed to attend to the special needs of native people; immigration groups and women; and, we stress, carrying capacity, waste assimilative capacity of our various ecosystems with respect to seasonal change and food availability.

Finally, population policy is a necessary but not sufficient condition for the alleviation of social and environmental problems. The stating of a target population figure, unless accompanied by specific plans for action and buttressed by co-operation and conviction at all levels of government, will not appreciably after the course of events.

Ontario

Population Growth

The population of Ontario grew from 2.9 million in 1921 to 7.7 million in 1971. This amounted to an increase of 4.8 million (165.5 percent) during the 50-year period. The growth acceleration in terms of absolute numbers is clearly revealed. During the first 20 years, 1921-1941, of the 50-year period, Ontario's population increased by .85 million compared to an increase of 3.1 million during the last 20 years, 1951-1971 (Table 3).

However, there are indications that Ontario's population growth is slowing down. Based on assumptions of lower immigration rates and declining total fertility and gross reproduction rates

> "the most probable projection puts the population of Ontario at 9,853,700 by 1986 - 2,150,000 larger than the 1971 census population."[16]

This modest forecast places Ontario's population index in 1986 at 128 compared to the index of 142.5 for the previous 15-year period, 1956-1971.

If the population is projected at a further modest increase to reach an index of 120 by the year 2000 based on the 1986 projections, then Ontario's population would increase by about 2 million to reach approximately 12 million by the year 2000. In this situation the population would increase by about 56 percent during the 30-year period, 1971 to 2000 compared to over a 100 percent increase from 1941-1971.

The 12 million projected for the year 2000 may be conservative. The authors of ARDA Report No. 7 have made the following estimates:

> "it seems reasonable to assume an annual percentage rate of increase for Ontario of 2 percent which would result in a 1991 population of 11,446,816."20/

If this rate continued, the population of Ontario would approach 14 million by the year 2000.

Food Production and Consumption

The need for land can be related to growth in population. If we assume that present levels of productivity in food production and present levels of food consumption will continue, then by the year 2000, a 56-percent increase in total productive acres of farmland will be required to provide food for a 56-percent increase in Ontario's population. However, productivity in food production has been increasing and food consumption patterns have been changing.

Despite declining acreages, the index numbers of physical volume of agricultural production in Ontario reached 126.3 in 1972 based on 1961 being equal to 100. The rate of growth in production was considerably less than all of Canada which had an index of 150.5 for the same period.1/ The increase in agricultural productivity in Ontario, has been due to a greater output per acre, per animal and per man.

Most of the cereal grain production in Ontario is for livestock feed. During the past 20 years the acreage of spring grains and winter wheat have declined while the acreage of grain corn increased fivefold (Appendix Table 8). Yields of cereal grains increased substantially. For instance, barley yields averaged 30 bushels per acre during the 5-year period, 1941-45 compared with nearly 50 bushels in the 1966-70 period, while grain corn yields increased from 46 to 83 bushels per acre (Figures 2, 3, 4, and 5).

Index of Acreages, Yields, and Prices for Selected Cereal Crops, Ontario, 1951-1971

Figure 2.— Oats

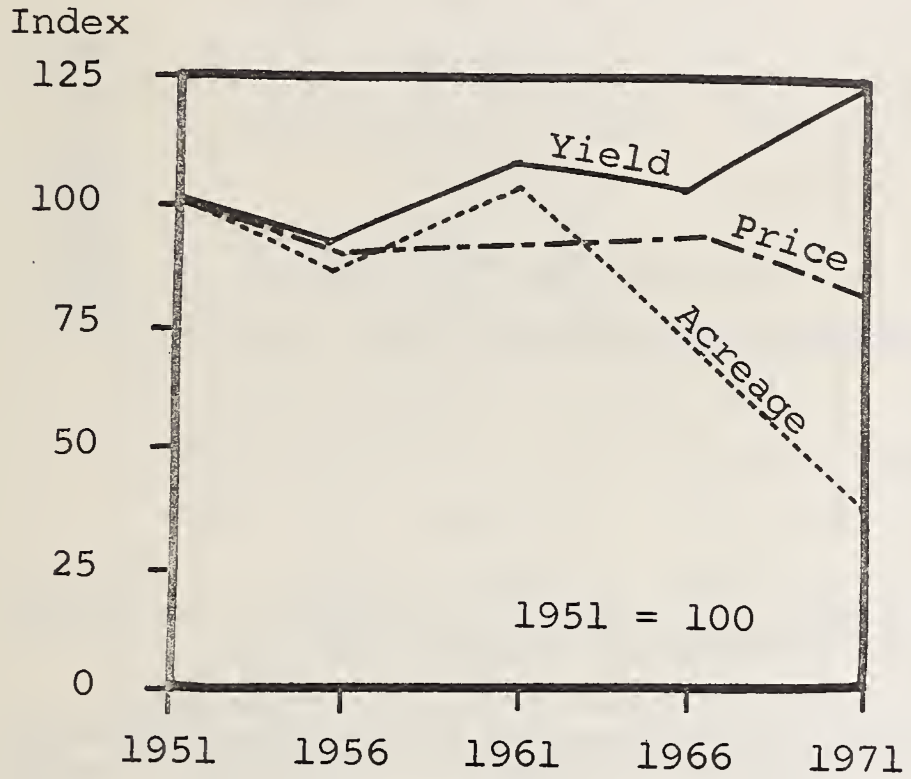


Figure 3.— Mixed Grain

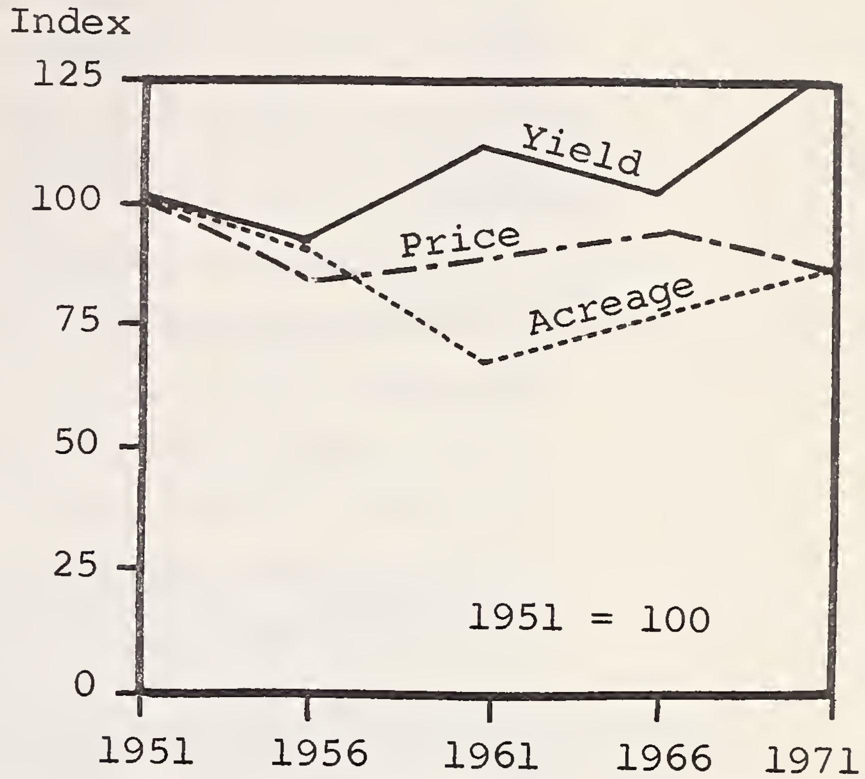


Figure 4.— Barley

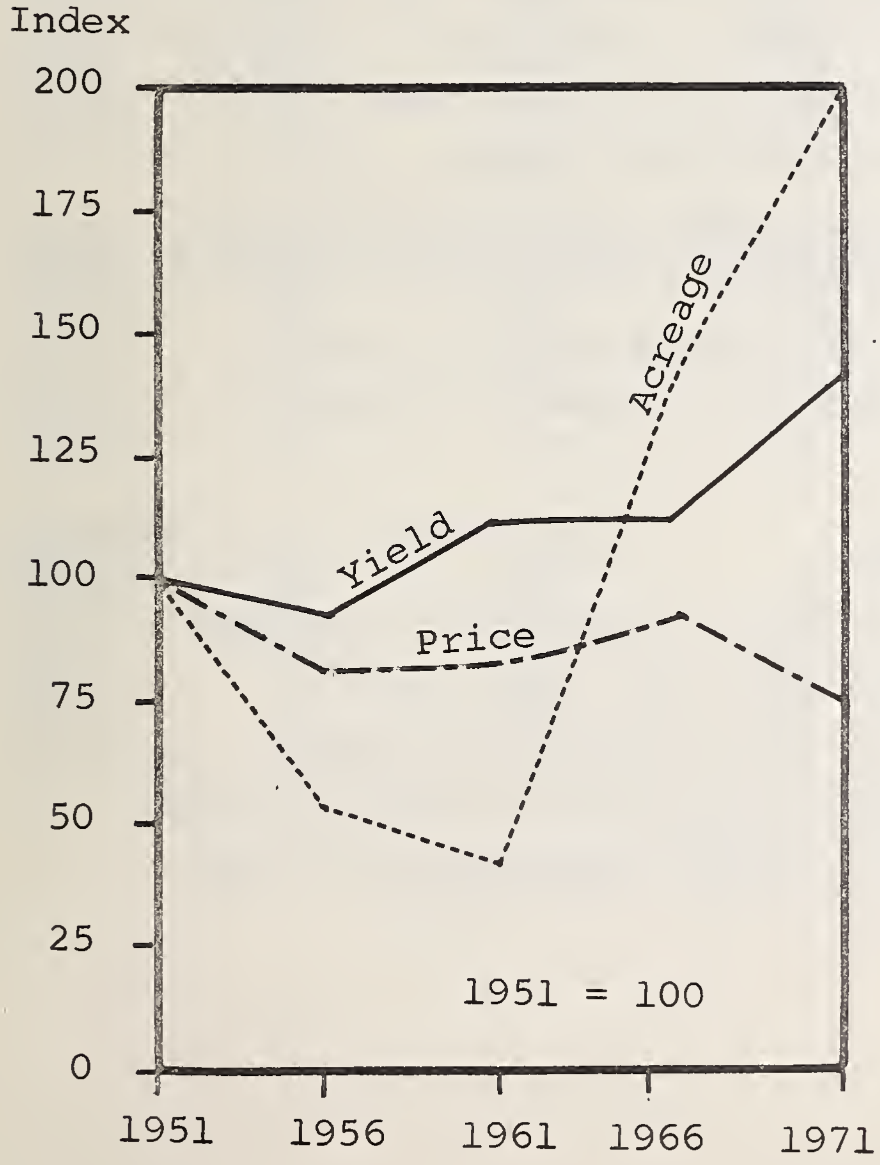
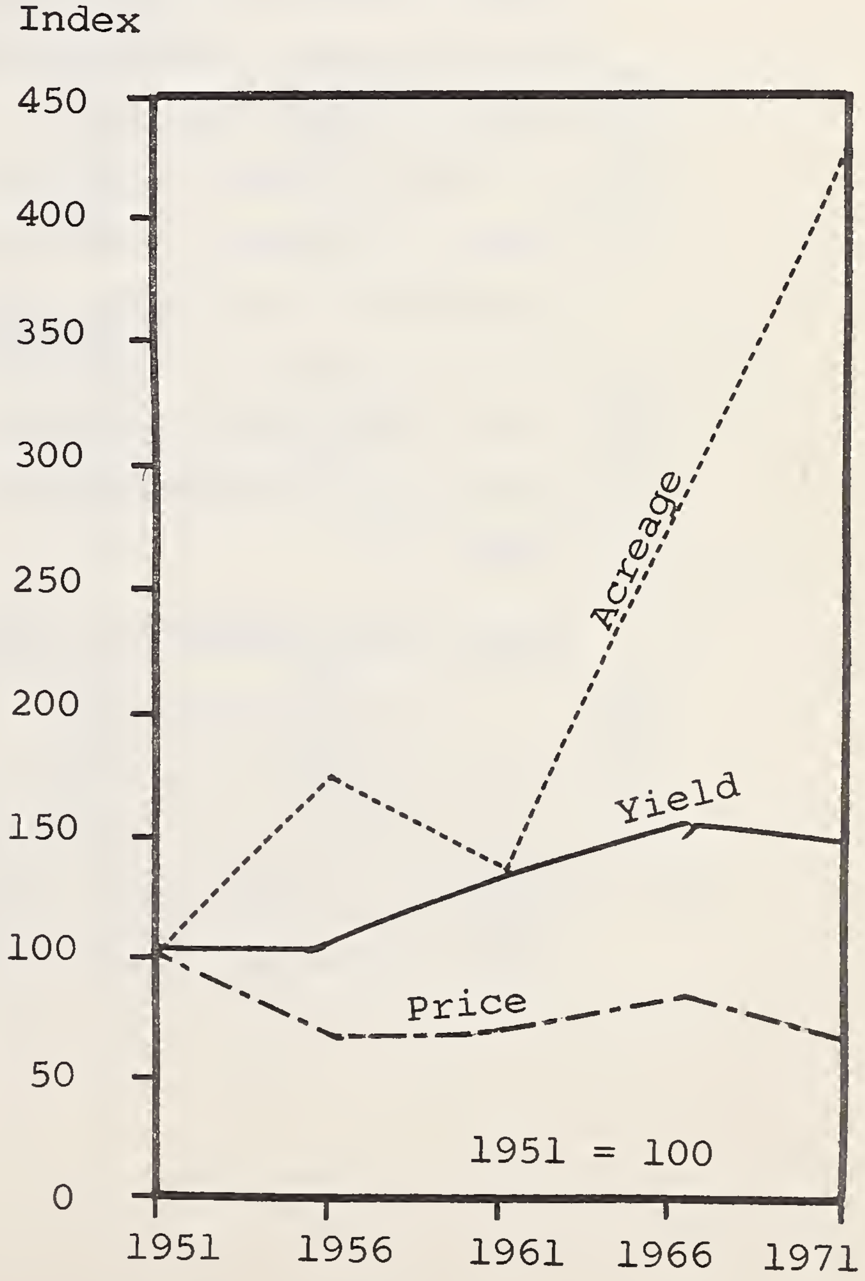


Figure 5.— Grain Corn



The total acreage devoted to hay and seeded pasture has declined. However, due to increased yields, total hay production in Ontario is higher now than 25 years ago. A significant increase in the acreage and yield of corn silage has ment that the total production has almost doubled (Appendix Table 8).

There has been a slight increase in the numbers of livestock in Ontario. Roughage consuming animal units declined from 2.4 million in 1951 to 2.2 million in 1971, while grain consuming animal units increased from 390,000 to over 622,000 (Table 10). Although there was a significant decline in the number of dairy cows, (18 percent) total milk production increased from 5 billion pounds in 1951 to 6.2 billion in 1971. During this period the average production per cow increased from about 5,300 to over 8,000 pounds. The number of beef cows more than doubled during the period to reach 435,000 head in 1971 (Table 11). The number of steers nearly tripled from 237,000 head in 1951 to 639,000 head in 1971. There have been substantial increases in the number of swine and poultry on Ontario farms. For instance, the number of swine under 6 months averaged 1.4 million in 1951 compared with 1.9 million in 1971, while the number of hens and pullets kept for laying purposes increased from 6.8 to 10.9 million (Appendix Table 9).

Meat and Livestock Products

Food consumption patterns indicate that Canadians are extensive users of land, because such a high proportion of their protein is derived from animal sources. Refinement of the Canadian data would indicate that, on a per capita basis, higher quantities of meat

Table 10.— Trends in the Number of Animal Units by Census Years, Ontario, 1951-1971 1/

Year	Roughage-consuming animals	Grain-consuming animals	Total
1971	2,151,947	622,419	2,774,366
1966	2,334,198	553,947	2,888,145
1961	2,409,874	468,165	2,878,039
1956	2,400,133	385,321	2,785,454
1951	2,357,142	390,067	2,747,209

Table 11.— Trends in Dairy Cow, Beef Cow and Steer Numbers on Ontario Farms, by Regions and by Census Years, 1951-1971 1/

Year	Southern	Western	Central	Eastern	Northern	Province
			'000			
Cows, 2 yrs. & over, kept for milking purposes						
1971	158	233	112	220	32	755
1966	201	275	134	257	42	909
1961	223	297	149	275	48	992
1956	222	294	166	287	57	1,026
1951	210	249	159	256	48	922
Cows, 2 yrs. & over, kept for beef purposes						
1971	69	160	91	81	34	435
1966	64	127	78	47	31	347
1961	71	119	69	39	20	319
1956	60	99	55	30	15	259
1951	52	96	41	17	9	215
Steers, 1 yr. old & over						
1971	162	342	72	52	11	639
1966	170	346	70	43	12	641
1961	118	262	58	46	11	495
1956	80	225	54	40	13	412
1951	50	127	32	20	7	237

are consumed in Ontario than the average consumption for all of Canada.

Beef

In Ontario, people have shown a strong preference for beef. The consumption of beef and veal reached 103 pounds per capita in 1970, an increase of 15.4 pounds since 1960. Projections indicate that consumption will exceed 117 pounds by 1980 (Table 12). The total demand for beef was estimated at 314.6 million pounds in 1952, 766.3 million in 1970 and is expected to increase to 992.4 million pounds by 1980.[25]

In a period of food shortages, beef becomes a luxury item when related to land use. The amount of farmland to produce beef is considerably more than the land required to produce pork or poultry products. Under Ontario conditions when the feed for the cow and the finished market animal is considered, it requires about an acre of land to produce 100 pounds of dressed beef. In comparison from an acre of mixed grain nearly

Table 12.— Per Capita Consumption of Livestock and Poultry Products, Ontario, 1960, 1970, 1980 and 2000

Product	1960	1970	1980	2000
Beef and veal	87.6	103.0	117.3	120.0
Pork	56.3	58.0	65.0	70.0
Mutton and lamb	3.4	3.9	4.6	6.0
Poultry	33.5	51.2	70.0	90.0
Total meat	180.8	216.1	256.9	286.0
Milk	993.6	958.0	920.0	700.0
Eggs	22.2	19.3	18.2	15.0

Source: Data for 1960, 1970 and 1980.[25]

500 pounds of dressed pork can be produced and from an acre of grain corn nearly 800 pounds. About 1,000 pounds of poultry meat can be produced from an acre of grain. It should be pointed out that our grains are produced on the better grades of land and much of the feed for the beef cow herds is from land not suited to grain production.

If we assume that the consumption of beef and veal in Ontario eventually settles around 120 pounds per person, then by the year 2000, Ontario with a population of 12 million, will be consuming about 1.44 billion pounds of beef and veal (Table 13). This is an increase of about 746 million pounds (107.5 percent) over the 694 million pounds produced in Ontario in 1970. At a production level of 1 acre per 100 pounds of beef this

Table 13 — Estimated Trends in Consumption of Livestock Products and Land Requirements, Ontario, 1970-2000

	1970		2000		
Product	Production	Consumption	Consumption (12 million population)	Consumption minus 1970's production	Extra land required at 1970's productivity level
		million pounds			'000 acres
Beef & veal	694.0	766.3	1,440.0	746.0	7,460
Pork	452.2	459.7	840.0	387.8	646
Mutton & lamb	6.5	29.0	72.0	65.5	655
Poultry	323.4	380.9	1,080.0	756.6	757
Milk	7,200.0	7,127.5	8,400.0	1,200.0	600
Eggs (million dozen)	165.3	143.6	180.0	14.7	29

Note: The extra acres required was calculated as follows: 1 acre required to produce 100 pounds of beef; 600 pounds of pork; 100 pounds of lamb and mutton; 1,000 pounds of poultry meat; 1 ton of milk; 500 dozen of eggs.

increase in beef consumption in Ontario would require an extra 7.46 million acres, nearly 70 percent of 10.8 million acres of improved farmland in Ontario today.

Under the above assumptions about population and consumption, an increase in productivity of 100 to 110 percent would be required to produce sufficient beef for Ontario's needs by the year 2000 on the same amount of land as required in 1970. Although there has been an increase in output per acre and per animal, an increase of this magnitude within the next 30 years, in all probability, is neither technically nor economically feasible.

To dramatize further the implications of the preferences for beef and the pressure for land, let us assume that the consumption of beef and veal increases at the rate of 10 pounds per decade and settles at 130 pounds per person by the year 2000. In the event the population of Ontario did reach 14 million then by the year 2000, the total consumption of beef and veal would reach 1.82 billion pounds, an increase of over 162 percent more than was produced in 1970. To produce this extra billion pounds of beef and veal at present productivity levels would require an area equivalent to all of the land presently under cultivation in Ontario.

Pork

The consumption of pork in Ontario has been somewhat erratic but the overall trend has been upwards from 56.3 pounds in 1960 to 58.0 pounds in 1970 (Table 12). An increase of 12 percent has been predicted in pork consumption which is expected to reach 65 pounds per capita by 1980.[25/] If we assume that the consumption of pork increases by 5 pounds, after 1980 and settles around 70 pounds per capita then with a population of 12 million, total pork consumption would amount to 840 million pounds or about 388 million pounds more than was produced in 1970. At present productivity levels, to produce this increase in total pork consumption under Ontario conditions would require an additional 646,000 acres (Table 13).

Poultry

The consumption of poultry meats in Ontario has increased from about 33.5 pounds per capita in 1960 to 51.2 pounds in 1970 (Table 12). It is expected to increase to 70 pounds by 1980 or by about 37 percent. If we assume that poultry consumption will level off at about 90 pounds per capita then with a population of 12 million, Ontario will require 1.1 billion pounds of poultry meat in the year 2000 or about 757 million pounds more than was produced in 1970.

If 1,000 pounds of poultry meat were produced from an acre of grain then an additional 757,000 acres of land would be required to produce the extra poultry required in Ontario by the year 2000 (Table 13).

Mutton and Lamb

Canada's production of mutton and lamb has declined sharply from nearly 60 million pounds in 1947 to less than 20 million pounds in the early 1970's. About 6 times as much is imported as is produced. Consumption in Ontario was estimated at 3.9 pounds per capita in 1970, it is expected to increase to 4.6 pounds by 1980.[25/] If consumption increases to 6 pounds per capita then Ontario with a population of 12 million will consume about 72 million pounds of mutton and lamb by the year 2000, about 65 million pounds more than was produced in 1970. If we assume that the same amount of land is required to produce lamb as beef (1 acre per 100 pounds) then about 655,000 acres will be required to produce the extra lamb and mutton required in Ontario (Table 13).

Milk

There has been a downward trend in the consumption of milk and egg products. On the basis of milk equivalents, the consumption of milk products has decreased by about 150 pounds per person during the last 20 years and was estimated at 958 pounds in 1970 (Table 12). If the consumption of milk products decline to about 700 pounds by 2000, then Ontario with 12 million people will consume about 4.2 million tons of dairy products or 600,000 tons more than was produced in 1970. Under present technology in Ontario, it requires at least one acre of land to produce 1 ton of milk. In this situation it would require an extra 600,000 acres of land to produce the extra milk required in Ontario by 2000.

Eggs

The yearly consumption of eggs in Ontario declined by about 4 dozen over the past 20 years to about 19.3 in 1970 (Table 12). If egg consumption declines to 15 dozens per capita by 2000, then Ontario with a population of 12 million people will consume about 180 million dozens of eggs or 15 million more dozens than was produced in 1970, requiring an additional 30,000 acres. If Ontario wished to retain its export market at about 20 million dozens then a further 40,000 acres would be required to produce the extra eggs by the year 2000.

Cereals

In addition to meats, cereals, fruits and vegetables are also important elements of our diets. The consumption of cereals has declined from about 170 pounds in the early 1950's to about 150 pounds. Most of our consumption of cereals is in the form of wheat flour which average 151.8 pounds per capita in 1951 and 124.1 pounds in 1971.

Fruits

In addition to strawberries and raspberries which covers about 3,100 acres, Ontario grows about 73,000 acres of fruit for a total production of about 567 million pounds or an average of about 7,800 pounds per acre. The consumption of fruit has increased from about 200 pounds per capita in 1950 to about 245 pounds in 1970.12/ In the early 1970's, Ontario has probably consumed about 1.8 billion pounds of fruit annually or over 3 times as much as was produced. If we assume the consumption of fruit will increase 30 pounds per capita by the year 2000 then Ontario's consumption of fresh fruit, with 12 million people would reach 3.3 billion pounds, nearly double the consumption of the early 1970's. In this situation even if Ontario doubled its production by the year 2000, it would also have to depend on double the imports of fruit.

Vegetables

There has been a steady increase in the consumption of vegetables in Canada, from slightly less than 50 pounds in the early 1950's to over 118 pounds in the early 1970's.12/ If vegetable consumption increases to 140 pounds per capita by 2000 then Ontario's total consumption would reach about 1.7 billion pounds or 790 million pounds (89 percent) more than was consumed in the early 1970's. In 1972, Ontario produced about 120,000 acres of vegetables. To increase this by 89 percent would require an additional 107,000 acres.

The per capita consumption of potatoes at 160 to 165 pounds was about the same in the early 1970's as in the early 1950's. If the consumption of potatoes stabilizes at 160 to 165 pounds per capita then an increase of 56 percent in population would result in a corresponding increase in total production. In 1970, total consumption of potatoes approximated 1.2 billion pounds of which about 783 million pounds was produced in Ontario. With 12 million people and a per capita intake of 160 pounds, Ontario's potato requirements would reach 1.92 billion pounds in the year 2000 or about 1.14 billion pounds more than were produced in the early 1970's. At an output of about 10 tons per acre, 54,000 acres of land in addition to the 42,000 acres of potatoes in the early 1970's would be required to produce the extra potato requirements.

Farmland

Prior to World War 11, Ontario had 22.4 million acres of farmland which amounted to nearly 10 percent of Ontario's total land area. Thirty years later close to 16 million acres or 7 percent of the total land area was in farmland, or 6.4 million acres, (28.7 percent), fewer in 1971 than in 1941. During the same period the acreage of improved land which would be composed of class 1, 2, 3, 4, soils declined by 2.5 million acres from 13.4 to 10.9 million acres (Table 14). Improved farmland in Ontario accounts for about 10 percent of the total improved land in Canada.

Table 14.— Trends in Occupied Farmland and Acres of Improved Land as a Percentage of the Total Land Area, Ontario, 1941-1971

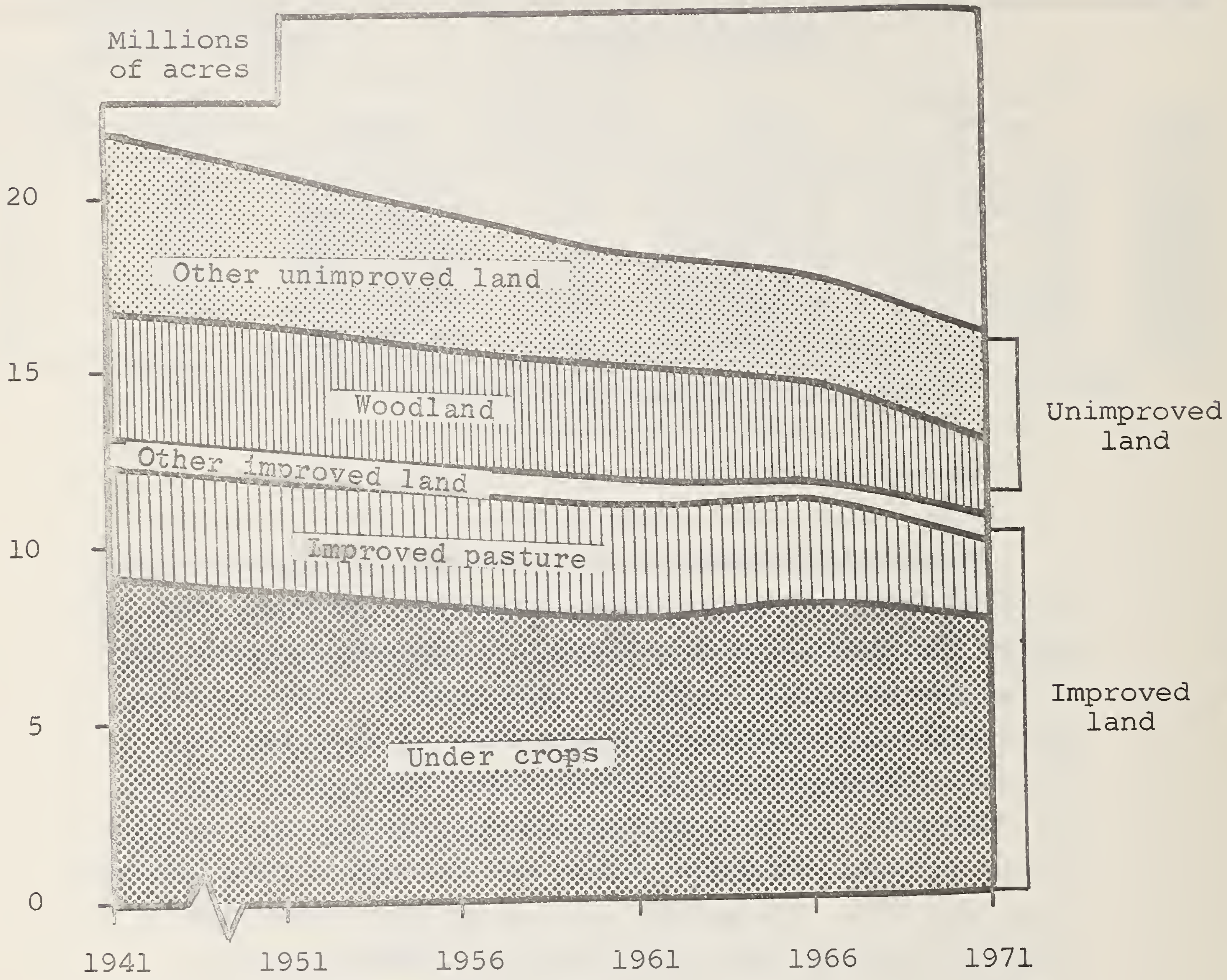
Year	Total land, acres	Occupied farmland Acres	Occupied farmland As p.c. of total land area	Improved land Acres	Improved land P.c. change	Improved land As p.c. of total land area
1971	226,702,720	15,963,056	7.0	10,864,601	-9.5	4.8
1966	226,702,720	17,826,045	7.9	12,004,305	-0.2	5.3
1961	226,702,720	18,578,507	8.2	12,032,924	-4.3	5.3
1956	226,702,720	19,879,646	8.8	12,572,157	-0.9	5.5
1951	226,702,720	20,880,054	9.2	12,693,250	-5.0	5.7
1941	226,702,720	22,387,981	9.8	13,363,361		5.9

Source: Agricultural Census of Canada.

The total decline of 20.3 percent in improved farmland in Ontario was somewhat sporadic. Between 1951 and 1956, the decline was less than 1 percent compared with a 9.5 percent drop in the 5-year period, 1966 to 1971. This startling increase in the rate of fall out is further revealed when data for the last 5-year period is compared with the 30-year trend. Of the 6.4 million acres of total farmland taken out of agriculture between 1941 and 1971, 29 percent or 1.9 million acres disappeared during the 5-year period, 1966 to 1971 (Figure 6). A much more rapid rate of decline occurred in the land classified as improved farmland. Between 1941 and 1971 of the 2.5 million acres taken out of agriculture, 46 percent or approximately 1.14 million acres occurred between 1966 and 1971.

It is clearly evident from the data that the demand for land for urban development was not the only reason for the decline in Ontario's farmland. Improved farmland in northern Ontario has declined at a faster rate than in southern Ontario. Of the total improved

Figure 6.— Distribution of Farmland in Ontario, by Census Years 1941-1971



farmland that disappeared from agriculture in northern Ontario between 1941 and 1971, nearly 50 percent (124,400 acres) occurred between 1966 and 1971. In southern Ontario where urban development was much greater, the rate of fall out during the same period was 45 percent (1.02 million acres of improved land). During the 25-year period, 1941 to 1966, in southern Ontario improved land moved out of agriculture at the rate of 49,400 acres per year. However, between 1966 and 1971 over 200,000 acres of improved land per year, over 550 acres per day and nearly 23 acres per hour was being removed from agriculture.

Not only has production in Ontario been taking place on fewer acres but also is being carried out by fewer farmers. The number of farmers declined from 178,200 in 1941 to 94,700 in 1971 (Table 15). During this same period, the farm population in Ontario declined from 704,420 to 391,713 or from 18.6 percent of the total population in 1941 to 5.1 percent in 1971. The average size of farms increased from 126 to 169 acres per farm.

The relationship of improved farmland to total population in Ontario changed from 3.5 acres to 1.4 acres per capita. At today's productivity and consumption levels, it requires at least 1.7 acres of land to produce the amount of meat and livestock products consumed per capita in Ontario. With 12 million people this would mean a total of over 20 million acres or

Table 15.— Number of Farms and Trends in Farm Size, by Census Years, 1941-1971

	Farms		Total farmland		Ave. size of farms	
	Number	Percent change	Acreage	Percent change	Acres	Percent change
1971	94,722	-13.8	15,963,056	-10.5	169	+ 4.3
1966	109,887	- 9.4	17,826,045	- 4.1	162	+ 5.9
1961	121,333	-19.1	18,578,507	-11.0	153	+10.1
1951	149,920	-15.9	20,880,054	- 6.7	139	+10.3
1941	178,204	-	22,387,981	-	126	-

Source: Census of Canada.

about twice the amount of improved land in Ontario in 1971. Even if productivity in crop and livestock production increased by 50 percent, it would still require 1.13 acres per capita of land to produce sufficient meat and livestock products.

In a situation where productivity in crop production increased by 50 percent, where the consumption of livestock products remained at today's level and where the population of Ontario reached 12 million people then it would require 13.5 million acres to provide sufficient livestock, livestock products or 2.7 million acres more than is under cultivation today. If consumption trends continue at a modest increase and 1.23 acres of land per capita were required to produce sufficient livestock products then a total of 14.8 million acres or 3.9 million more than is in production today would be required.

As has happened in the past, in all probability, a proportion of our food will be imported from other provinces in Canada and possibly from other countries. The prairie provinces will no doubt continue to provide Ontario with cereal grains and feeder cattle, at a price. The world population increasing at a rate out of all proportion to the foreseeable increase in food production will create a tremendous demand for food resulting in much higher prices for cereal grains and livestock products. In addition, Canada's traditional sources of meats, fruit and protein supplement are in jeopardy and may be eliminated by the year 2000. Witness the embargoes placed on exports during the recent food shortages. Because food is such a basic human need and required in constant quantities, a small deficit in production tends to push food prices sky high while a small surplus tends to have the opposite effect.

As the world demand and prices for food increase, the people in Ontario will have to spend a greater proportion of their income for food. Pressures will build up for more production at home. More production at home can be achieved in two ways:

(a) Greater productivity per acre per animal and per man and

(b) By bringing more acres into production.

To increase productivity we can look to new higher producing strains of plants and animals, the wide adoption of improved methods in controlling plant and animal diseases; the wide adoption of improved cultural practices and greater applications of inputs. Many of these inputs such as fertilizers, weedsprays and energy will also be in demand throughout the world and may be available only at magnified prices.

Initially as food prices rise and the spread between farm costs and farm incomes widens a dramatic increase in output per acre on existing farmland will occur. More attention will be directed to the timeliness of operators and the seeding of more productive varieties and better quality seeds. Closer attention to the health and the feeding of animals as they increase in value, will create demands for additional veterinary services. Unless limits are placed on their use, greater quantities of commercial fertilizers and weed sprays will be applied.

Marginal land on existing farms will be brought into more intensive production through drainage, fence row and stone removal and land clearing. Demand from farmers will increase for productive land owned by the non-farm population resulting in more intensive production and eventually in higher rents. As the price of food continues upward, irrigation will play a more dominant role in food production creating a demand for water. For instance when the price of corn reaches $5 or $6 per bushel, it may become economical to irrigate large acreages of corn.

Through programs of clearing, seeding and fertilization, areas of non-tillable land will be developed for pasture production. According to Professors Watkin and Winch,[7/] non-arable land in Ontario, if renovated and improved, could provide pasture for a greatly increased beef cow herd.

> "It has been estimated that only 50,000 animal units utilize rough land pastures at the present time. However, if the areas of unimproved pastures (including both deep and shallow soil types) were utilized to the fullest extent these pastures could support 190,000 animal units in the southern part of the province. With improvement through renovation the potential carrying capacity could be raised to 1.56 million animal units. Similarly pasture carrying capacity in the north and near north could be increased from 78,000 to 4.3 million animal units. Thus, within Ontario there is a grazing land resource which has the capacity to support 5.86 million animal units during the summer grazing period June to September.
>
> "This capacity to support 5.86 million cows and calves is based solely upon the size of the non-arable land resource. The other aspect determining this potential is the need for winter feed. Any developments associated with pasture improvement and livestock enterprises on roughland pastures must include consideration and development of the above feed requirements as an integral program utilizing arable and pasture lands in farm improvement schemes. Depending upon the location of a cow-calf enterprise in the province, winter feed must be produced from other land resources to provision those cattle over periods ranging from 185 to 240 days."

While the situation just described may present a picture of unlimited potential for food production, there is no cause for complacency in the development and implementation of land use plans to retard if not to reverse the movement of land out of agriculture. If the rate of fall out which occurred in southern Ontario during the 1966-1971 period, of 200,000 acres of improved farmland per year continues, practically all of the tillable land in southern Ontario would disappear from agricultural use within the next 50 years. Certainly one half of it will be gone within the 25 years if market forces are allowed to reign unconfined in the allocation of land to various uses.

Historically throughout the world communities and cities have developed on the more productive soils and as urban development continues so continues the reduction of desirable land for food production. Ontario is no exception. The basic requirements for food production, land, water, and climate are mainly fixed in space and in combination govern the potential for food production. For instance, there is a considerable difference between the response of clay soils in southern Ontario to management and cultural practices and the response of the soils of the great clay belt in northern Ontario.

The choice of crops are limited by the severity of the climate in northern Ontario. While root crops can be grown with some measure of success under present day technology, the most suitable crops are hay and pasture. The production of cereal grains is questionable due to the short growing season and unpredictable yields. In addition, due to the longer winters, more stored feed and consequently higher feed costs, is required for livestock production.

Huge capital investments for land clearing, drainage, services and for farm building would be required to bring appreciable amounts of land into production in northern Ontario. It may well be that since the yield response might not warrant such expenditures of capital only a small portion of the potential agricultural land can be economically brought into production. To follow the reasoning of some land use planners and economists, it is conceivable that a situation could evolve whereby people in southern Ontario were undernourished, while at the same time the province lacked the resources to develop productive land in northern Ontario.

The irony of such a situation is self evident. Hungry people will be located on land in southern Ontario that was once productive farmland and starving, while in northern Ontario potential agricultural land is lying idle because no one can afford to cultivate it.

The Central Ontario Lakeshore Urban Development Area (COLUC)

The COLUC study area encircles Lake Ontario from Hamilton to Oshawa and includes the counties of Wentworth, Halton, Peel, Ontario and parts of York and Durham. This area has experienced the impact of urban development, more than any other of comparable size in Ontario.

Farmland

According to the 1951 census, there were 16,741 farmers in the region operating about 1.7 million acres of farmland of which 1.2 million acres were classified as improved land. Twenty years later by 1971, the number of farmers declined by 45 percent to 9,234. The acres of land had declined by 32 percent to 1.15 million and improved farmland accounted for 873,000 acres or 29 percent less than in 1951 (Table 16 and Figure 7). Between 1951 and 1966, approximately 224,000 acres of improved land were removed from agriculture. This amounted to a fall out of 15,000 acres per year during the 15-year period. However, the decrease was much faster in the 1966-1971 period when 134,000 acres disappeared from agriculture at an average annual rate of 26,800 acres per year. Since the number of farms declined at a faster rate than the area of farmland, farms in the area increased in size from about 77 to 94 tillable acres per farm between 1951 and 1971 (Table 17 and Figure 8).

The proportion of farms under 10 acres declined slightly and by 1971, nearly 60 percent of the 9,000 farms in the COLUC study area were over 70 acres in size and 23 percent of the farms had 180 acres or more (Table 18).

Table 16.— Trends in Occupied, Improved and Unimproved Farmland and in Number of Farms in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

						Percentage change		
Farmland	1951	1956	1961	1966	1971	1951-1961	1966-1971	1951-1971
			'000 acres					
Occupied	1,674	1,521	1,375	1,299	1,146	-18	-12	-32
Improved	1,231	1,133	1,042	1,007	873	-15	-13	-29
Unimproved	443	388	333	292	273	-25	-07	-38
Under crops	850	742	709	717	648	-17	-10	-24
Number of farms	16,741	13,984	11,781	10,691	9,234	-30	-14	-45

Source: Census of Canada.

Figure 7.— Distribution of Farmland in the Central Ontario Lakeshore Urban Complex Study Area by Census Years

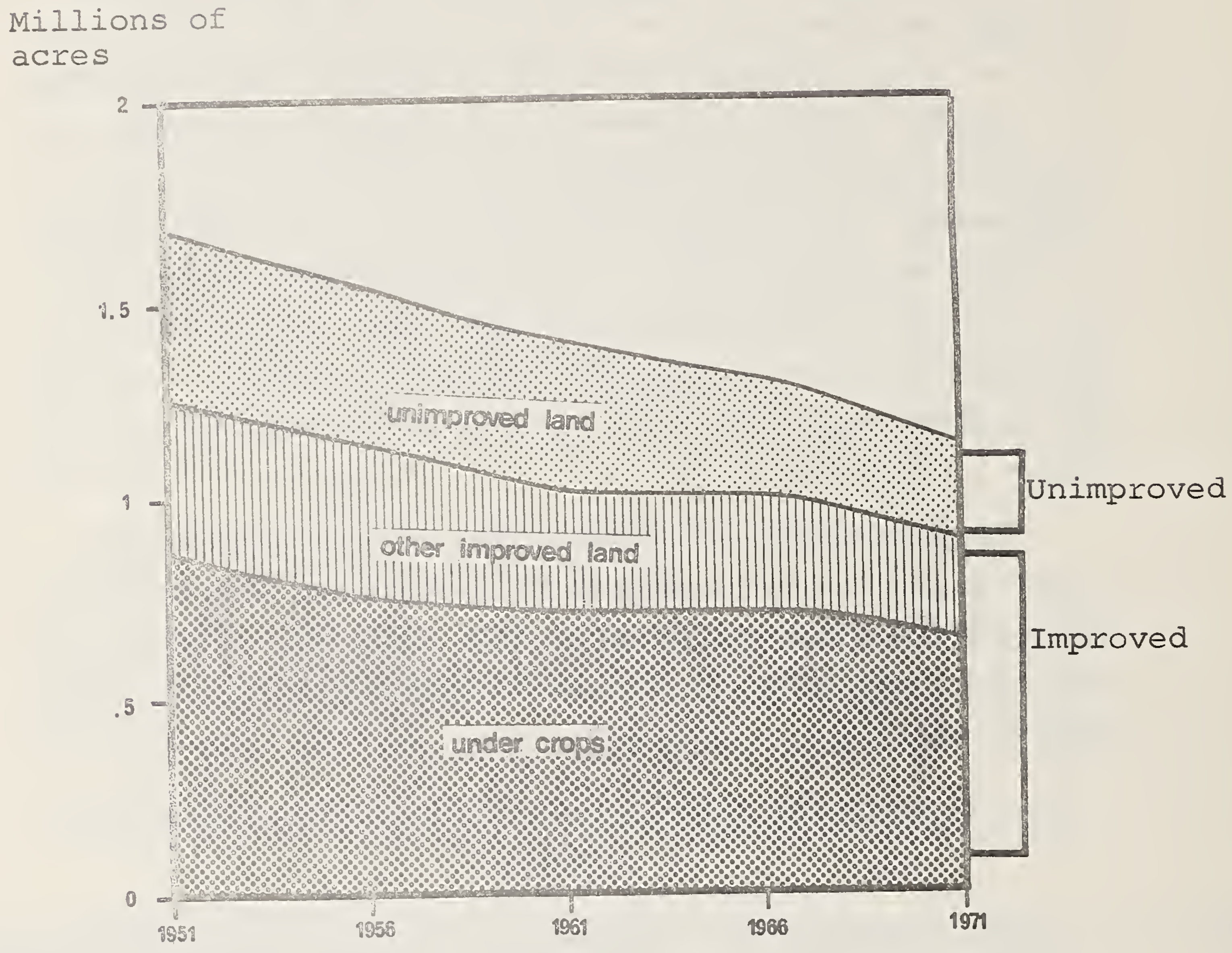


Table 17.— Trends in Average Size of Farms in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

	1951	1956	1961	1966	1971
	Number of acres				
Improved acres per farm	76.8	81.0	90.5	95.9	94.5
Total acres per farm	104.5	108.7	119.3	123.6	124.1

Source: Census of Canada.

Figure 8.— Trends in Number of Farms, Improved Acres and Total Acres Per Farm in the Central Ontario Lakeshore Urban Complex Study Area

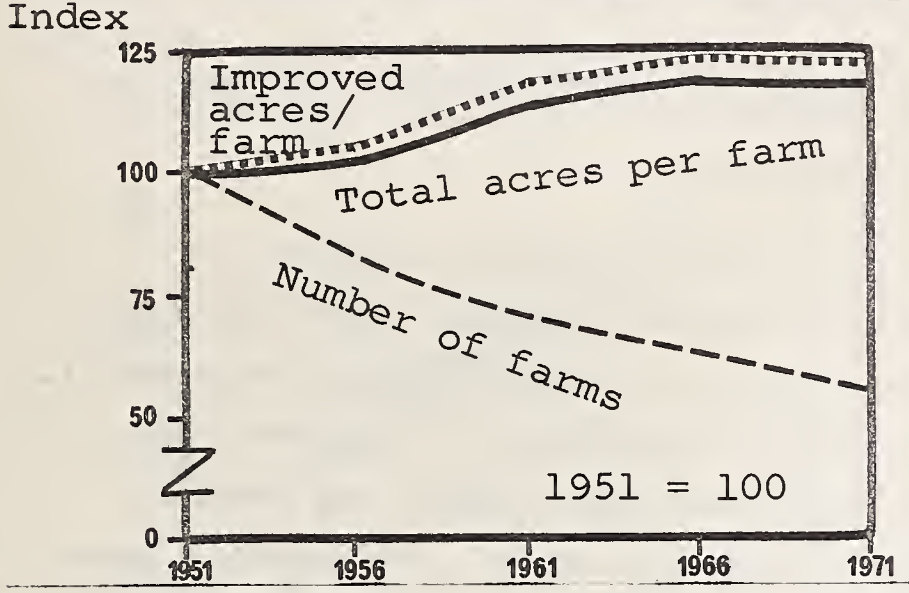


Table 18.— Trends in the Percentage Distribution of Total Farms by Size Groups in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

	1951	1956	1961	1966	1971
Under 10 acres	11.90	10.88	11.07	10.98	10.02
10-69	22.91	23.86	22.74	25.23	31.00
70-179	45.16	47.70	45.21	41.15	35.90
180-399	14.69	16.12	18.85	19.43	18.91
400 and over	1.08	1.43	2.13	3.22	4.17
Non-resident	4.26	-	-	-	-

Source: Census of Canada.

Crop and Livestock Production

Throughout the COLUC study area the acreages of the higher producing, higher value crops including vegetables increased significantly, while other crops including fruits declined. In forage production, the acreage of hay declined by 24 percent between 1951 and 1971 while the acreage of corn silage increased by 58 percent and the total production of corn silage increased by 116 percent (Appendix Table 10). There was also a marked increase in the acreage and production of barley, grain corn and vegetables. The acreage of fruit dropped by 52 percent during the period. The value at the farm of fruits and vegetables exceeded 14.7 million dollars in 1971.

The number of milk cows and heifers kept for milking purposes declined by 41 percent from 142,000 in 1951 to 83,000 head in 1971 (Table 19 and Figure 9). The number of beef cows increased by 63 percent to reach 56,000 head in 1971 and the number of feeder steers reached 39,513, an increase of 264 percent over 1951. There was a slight increase in the number of swine and a substantial increase in poultry kept on these farms (Tables 20, 21 and Figures 10, 11).

Estimates would indicate that in the COLUC study area, sufficient livestock products were produced for the following number of people:

Milk - 80,000 people
Beef - 330,000 people
Pork - 1.4 million people
Eggs - 1 million people

Table 19.— Trends in Dairy, Beef and Total Cattle Numbers in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

	1951	1956	1961	1966	1971	1972
Milk cows and heifers for milk purposes	142,147	109,583	96,062	86,701	83,379	80,320
Beef cows and heifers for beef purposes	34,195	41,551	52,860	59,434	55,832	56,848
Steers	10,853	26,832	31,321	39,619	39,513	42,095
Total cattle	244,783	273,679	277,254	265,823	242,026	292,087

Source: Census of Canada.

Figure 9.— Trends in Diary, Beef and Total Cattle Numbers in the Central Ontario Lakeshore Urban Complex Study Area

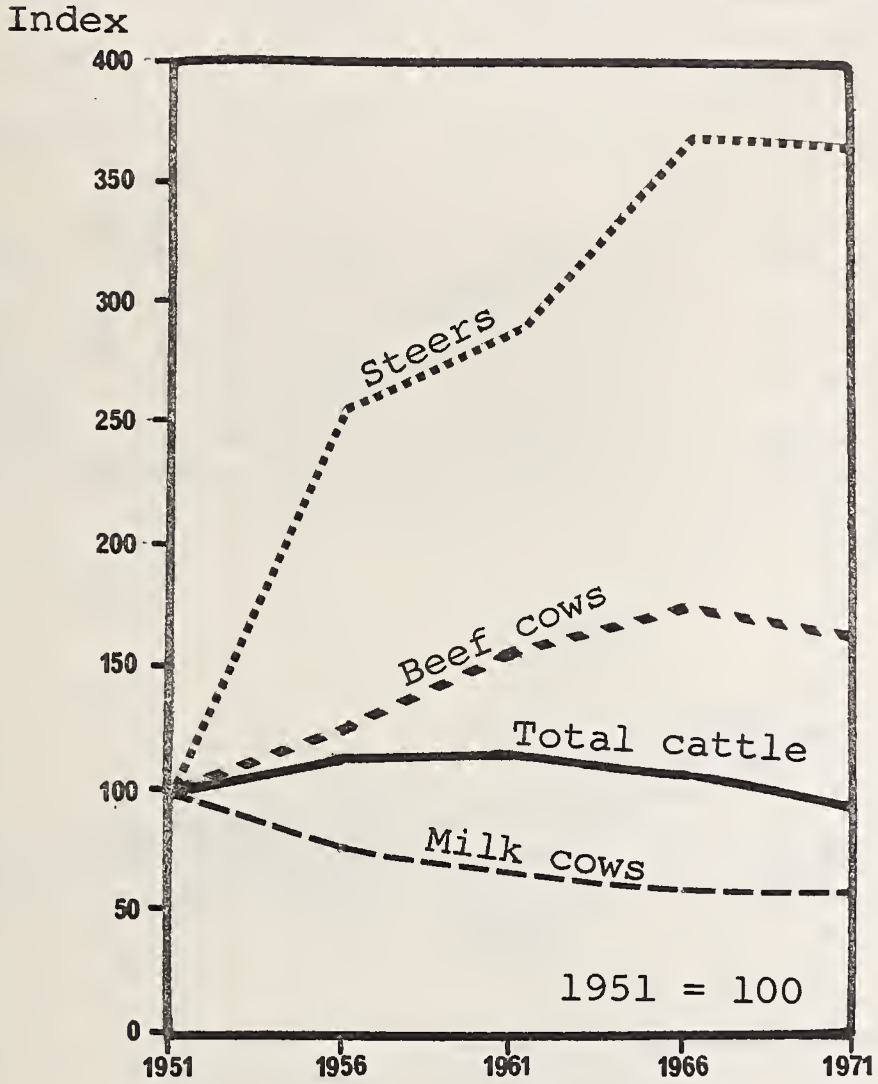


Table 20.— Trends in Horse, Sheep and Swine Numbers in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

	1951	1956	1961	1966	1971	1972
Horses	25,303	13,420	9,323	10,987	14,791	14,694
Swine:						
Under 6 mths.	153,082	126,852	137,941	142,375	162,515	146,980
6 mths. and over	38,049	28,299	37,451	39,198	34,033	32,200
Total swine	191,131	155,151	175,392	181,573	196,548	179,180
Sheep	20,647	22,490	19,913	18,306	16,795	17,822
Lambs	22,037	24,792	18,539	15,984	12,229	10,568
Total sheep	42,684	47,282	38,452	34,290	29,024	28,390

Source: Census of Canada.

Table 21.— Trends in Poultry Numbers in the Central Ontario Lakeshore Urban Complex Study Area, 1951-1971

	1951	1956	1961	1966	1971
Hens and pullets	803,509	802,419	1,078,993	926,811	988,159
Total hens & chickens	3,240,079	3,203,532	3,531,140	3,632,372	4,770,947
Turkeys	91,520	259,700	280,315	337,314	297,194
Ducks	38,367	38,979	54,364	79,940	92,855
Geese	19,430	11,598	8,849	7,614	6,896

Source: Census of Canada.

Figure 10.— Trends in Number of Horses, Sheep and Swine in the Central Ontario Lakeshore Urban Complex Study Area

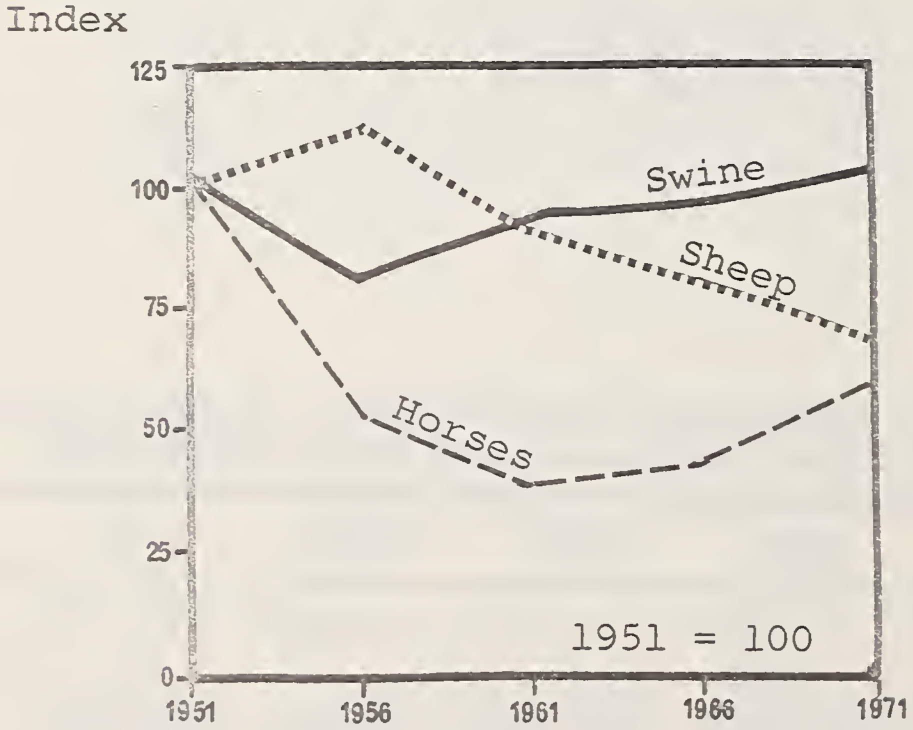
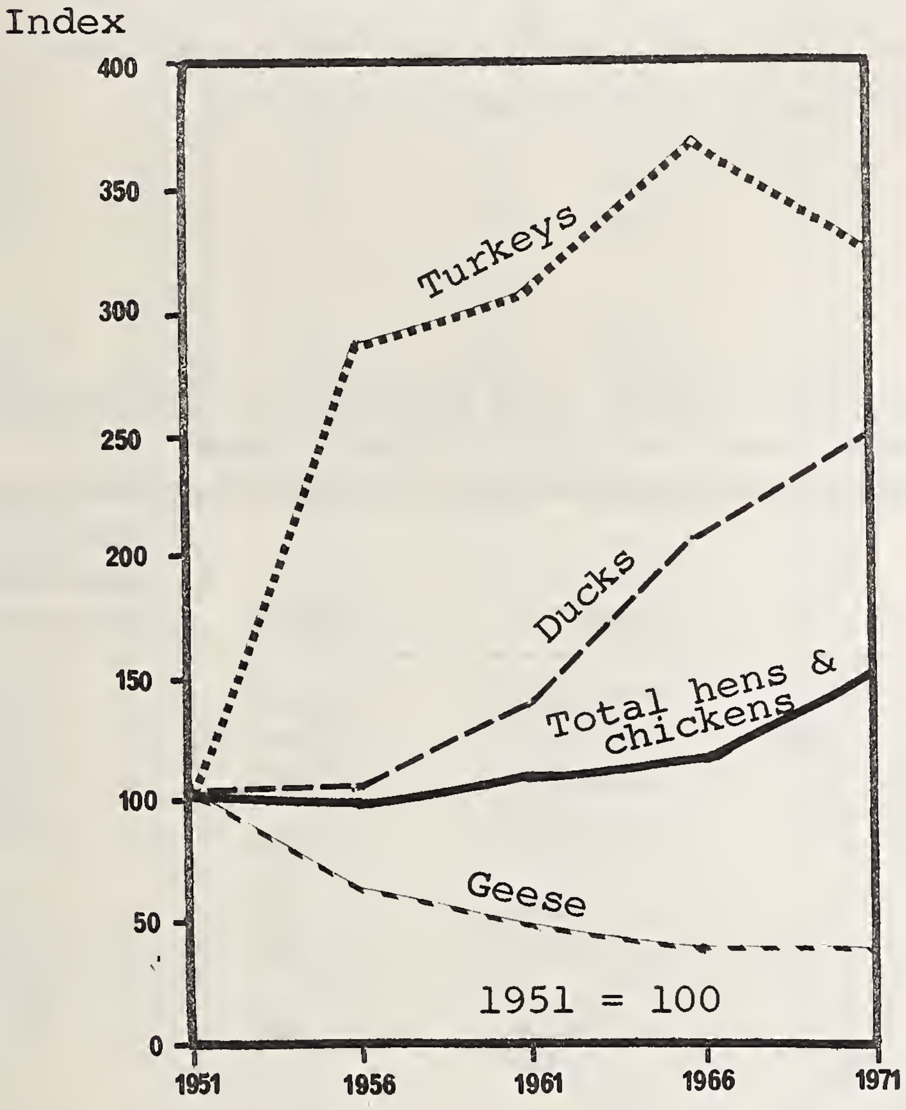


Figure 11.— Trends in Poultry - Total Hens and Chickens, Turkeys, Ducks and Geese in the Central Ontario Lakeshore Urban Complex Study Area



Agriculture in COLUC and Ontario

From an agricultural point of view, the COLUC study area is significant proportion of the Ontario total. Approximately 9.7 percent of Ontario's farmers located in the COLUC area operate about 8 percent of Ontario's improved farmland; keep 11 percent of Ontario's dairy herd and nearly 13 percent of the beef herd in addition to producing a considerable proportion of other products (Table 22). For instance, over 14 percent of Ontario's fruits and potatoes, and 16 percent of the vegetables are produced in the COLUC study area.

Through the adoption of improved cultural and sound farm business management principles, estimates indicate that there is still sufficient farmland in the COLUC area to produce the meat, milk, and eggs required for 800,000 people at today's consumption levels.

Table 22.— Farmland, Number of Farms, and Numbers of Livestock on Farms in Ontario and the COLUC Study Area, 1971

	Ontario	COLUC	COLUC as a percent of Ontario
Number of farms	94,722	9,234	9.7
Occupied farmland, acres, '000	15,963	1,146	7.2
Improved land, acres, '000	10,865	873	8.0
Total acres per farm, no.	169	124	73.4
Dairy cows, no. '000	755	83	11.0
Beef cows, no. '000	435	56	12.9
Steers, 1-year and over, no. '000	639	40	6.3
Swine, under 6-mos. no. '000	1,931	163	8.4
Hens & pullets for laying, no. '000	10,902	988	9.1
Selected crop acreages			
Hay and corn silage	3,322,000	284,861	8.6
Cereal grains and fall rye[a]	3,615,000	304,397	8.4
Fruits	76,979	11,411	14.8
Vegetables	111,118	17,951	16.2
Potatoes	40,000	5,725	14.3

[a] Does not include buckwheat and spring wheat.

Source: Census of Canada.

Appendix Table 1.— Per Capita Consumption of Meats and Eggs, Canada, 1951-1972

Year	Beef	Veal	Mutton & lamb	Pork	Offal	Canned meat	Total poultry	Eggs
1951	49.2	7.6	2.0	58.4	4.7	4.7	18.0	15.0
1952	54.2	6.9	2.2	55.9	5.2	5.1	21.7	17.9
1953	64.9	8.1	2.4	48.6	5.0	3.9	19.8	15.9
1954	70.0	8.6	2.5	45.3	4.8	4.3	21.7	16.6
1955	69.0	8.4	2.6	49.1	5.3	4.3	24.2	18.8
1956	71.2	8.5	2.6	49.0	5.2	5.0	25.5	19.1
1957	71.8	8.9	2.6	44.3	5.1	4.9	25.8	19.3
1958	67.9	7.3	2.7	49.2	4.8	5.6	27.5	21.0
1959	65.4	6.9	2.9	56.5	4.9	4.3	30.2	21.9
1960	69.8	6.9	2.9	52.5	4.8	7.5	27.6	20.8
1961	70.5	6.8	3.5	50.3	4.5	5.4	31.1	23.0
1962	71.1	7.1	3.8	50.1	4.3	5.3	31.0	22.9
1963	74.3	6.5	4.0	50.7	4.0	5.2	32.9	24.2
1964	79.4	7.2	3.4	51.8	3.9	5.8	35.0	25.9
1965	83.6	8.3	2.8	47.9	3.6	5.4	36.6	26.6
1966	84.2	7.0	3.4	46.9	3.6	5.5	39.3	28.5
1967	84.1	7.2	3.6	53.8	3.9	6.2	40.8	29.9
1968	86.8	6.4	4.2	53.7	3.8	6.6	39.8	29.6
1969	87.7	5.1	4.0	52.0	3.9	7.6	43.1	32.6
1970	85.9	4.4	3.8	57.2	3.4	7.9	45.2	34.6
1971	87.2	4.4	3.3	66.2	4.3	- [a]	44.5	33.6
1972	92.5	3.5	4.6	61.1	4.1	- [a]	45.4	34.5

[a] Due to a change in source data, comparable information is not available.

Source: Handbook of Food Expenditures, Price and Consumption by Zuhair A. Hassan, Economics Branch Publication, Agriculture Canada, 1973.

Appendix Table 2.— Per Capita Consumption, Dairy Products, Fruits and Vegetables, Canada, 1951-1971

Year	Butter	Cereals	Total dairy products	Fish	Fruit	Oils & fats	Potatoes	Pulses & nuts	Vegetables
1951	21.22	171.5	1,012.50	13.5	212.4	27.5	161.2	11.9	160.5
1952	20.82	166.9	1,001.14	13.5	227.3	28.5	162.7	10.0	162.2
1953	20.88	161.7	1,006.18	13.7	229.5	27.9	169.0	11.0	168.5
1954	20.71	165.0	1,001.07	13.5	232.0	28.1	158.8	9.9	158.2
1955	20.27	160.0	1,011.42	13.6	241.8	28.4	158.8	10.5	157.4
1956	20.51	163.6	1,025.00	13.5	231.3	28.9	161.8	11.4	161.2
1957	20.26	155.4	1,002.89	13.4	238.8	28.2	164.9	11.0	164.3
1958	19.11	157.8	963.41	13.7	241.6	29.7	162.3	10.2	161.8
1959	18.1	152.8	927.87	13.3	249.6	31.7	158.0	9.7	157.5
1960	16.95	154.4	893.58	12.6	245.4	32.0	153.9	10.0	153.4
1961	16.49	152.6	865.83	12.4	237.0	31.8	156.2	10.1	155.8
1962	17.89	150.3	891.23	12.4	239.1	32.5	157.8	9.2	157.4
1963	19.11	157.2	915.73	14.5	236.4	31.6	154.8	9.5	154.4
1964	18.98	145.3	911.11	13.2	233.7	31.7	155.5	10.4	157.1
1965	18.52	163.4	902.39	13.5	243.1	30.5	146.1	10.8	156.0
1966	17.76	149.9	881.38	12.9	242.7	34.6	189.9	12.2	177.6
1967	16.91	149.4	863.12	13.4	254.5	34.4	147.9	10.6	170.3
1968	16.47	149.4	846.90	12.7	248.6	35.5	174.9	11.1	170.2
1969	15.71	153.3	829.66	12.9	245.3	38.6	160.0	9.9	160.0
1970	15.73	152.2	835.78	12.0	244.7	38.2	155.9	14.2	155.9
1971	15.70	146.1	842.33	11.4	252.8	38.0	170.6	17.5	163.4

Source: Handbook of Food Expenditures, Price and Consumption by Zuhair A. Hassan, Economics Branch Publication, Agriculture Canada, 1973.

Appendix Table 3.— Trends in Acreages of Cereal Crops by 5-Year Averages, Canada, 1939-1973 ('000)

Years	Wheat	Oats	Barley	Mixed grain	Grain corn	Total acres of cereal crops
1939-43	23,145	13,126	5,804	1,322	259	43,656
1944-48	23,616	11,998	6,786	1,191	244	43,834
1949-53	26,500	11,000	7,532	1,503	370	46,905
1954-58	22,938	9,909	7,269	1,554	509	42,179
1959-63	25,748	9,466	6,344	1,466	452	43,476
1964-68	29,441	7,793	7,181	1,608	810	46,832
1969-73	20,558	6,962	11,850	1,947	1,225	42,542

Source: Census of Canada.

Appendix Table 4 .— Production of Cereal Grains, by 5-Year Periods, Canada, 1939-1943 to 1969-1973

Period	Wheat	Oats	Barley	Mixed grain	Grain corn	Total production
		'000 pounds				'000 tons
1939-43	26,567,604	14,783,472	7,509,264	1,795,448	575,770	25,616
1944-48	22,352,388	12,251,104	7,441,315	1,766,936	595,862	22,204
1949-53	32,666,508	14,180,292	10,412,803	2,499,000	988,366	30,373
1954-58	26,579,940	12,484,882	11,032,138	2,585,248	1,652,818	27,168
1959-63	30,430,152	13,419,059	8,719,766	2,584,360	1,691,312	28,422
1964-68	39,781,656	12,331,848	12,085,478	3,065,488	3,742,950	35,504
1969-73	32,394,192	11,882,946	23,453,386	3,915,000	5,390,090	38,518

Source: Census of Canada.

Appendix

Table 5.— 1960 Production-Demand Comparisons for Canada (1,000 metric tons)4/

Commodity	Domestic disappearance				
	Food and industrial	Feed	Total	Production	Excess demand
Cereals	2,941	11,474	14,415	21,774	-7,359
Raw sugar	967	-	967	208	759
Root crops	1,808	105	1,913	1,906	7
Pulses	89	7	96	59	37
Fruit, veg.	3,117	-	3,117	1,861	1,256
Oil crops	190	474	664	377	287
Meat	1,454	-	1,454	1,454	-
Milk	7,233	1,114	8,347	8,533	-184
Eggs	302	-	302	306	-4

Appendix

Table 6.— 1985 and 2000 Production Projections for Canada (1,000 metric tons)4/

Commodity	1985 Production	2000 Production
Cereals	37,674	42,944
Raw sugar	268	296
Root crops	3,256	4,023
Pulses	67	67
Fruit, veg.	1,994	2,062
Oil crops	912	1,237

Appendix

Table 7.— 1985 and 2000 Production-Demand Comparisons for Canada, Assuming Medium Population Growth Rates (1,000 metric tons)4/

1985 Comparisons, assuming constant per capita income

Commodity	Domestic disappearance: Food and industrial	Feed	Total	Excess demand
Cereals	4,657	18,172	22,829	-14,843
Raw sugar	1,531	-	1,531	1,263
Root crops	2,863	166	3,029	-227
Pulses	141	12	153	86
Fruit, veg.	4,936	-	4,936	2,942
Oil crops	300	751	1,051	140
Meat	2,302	-	2,302	-
Milk	11,455	1,764	13,219	-
Eggs	478	-	478	-

1985 Comparisons, assuming historical income growth rates

Commodity	Domestic disappearance: Food and industrial	Feed	Total	Excess demand
Cereals	4,416	19,804	24,220	-13,453
Raw sugar	1,531	-	1,531	1,263
Root crops	2,476	181	2,657	-599
Pulses	135	13	148	81
Fruit, veg.	5,754	-	5,754	3,759
Oil crops	331	819	1,150	238
Meat	2,699	-	2,699	-
Milk	10,397	1,923	12,320	-
Eggs	455	-	455	-

(Appendix Table 7 is concluded on the next page.)

Appendix

Table 7.— Concluded

2000 Comparisons, assuming constant per capita income

Commodity	Domestic disappearance Food and industrial	Feed	Total	Excess demand
Cereals	6,149	23,993	30,142	-12,801
Raw sugar	2,022	-	2,022	1,726
Root crops	3,780	219	3,999	-24
Pulses	186	16	202	135
Fruit, veg.	6,517	-	6,517	4,456
Oil crops	397	992	1,389	152
Meat	3,040	-	3,040	-
Milk	15,124	2,330	17,454	-
Eggs	631	-	631	-

2000 Comparisons, assuming historical income growth rates

Commodity	Domestic disappearance Food and industrial	Feed	Total	Excess demand
Cereals	5,723	27,590	33,313	-9,630
Raw sugar	2,022	-	2,022	1,726
Root crops	3,108	251	3,359	-663
Pulses	175	18	193	126
Fruit, veg.	8,241	-	8,241	6,179
Oil crops	452	1,141	1,593	356
Meat	3,876	-	3,876	-
Milk	13,273	3,679	15,952	-
Eggs	591	-	591	-

Appendix Table 8.— Trends in Acreages and Yields of Selected Forage and Cereal Grain Crops, Ontario, 1951-1971 1/

Crop and year	Acres	Yield
	'000	tons per acre
Corn silage		
1971	616	14
1966	454	12
1961	269	12
1956	290	9
1951	282	10
Hay		
1971	2,706	2.4
1966	3,418	2.3
1961	3,281	2.3
1956	3,290	2.0
1951	3,406	2.2
		bushels per acre
Winter wheat		
1971	340	41
1966	341	44
1961	561	36
1956	625	32
1951	703	28
Oats		
1971	650	58
1966	1,280	49
1961	1,833	51
1956	1,525	43
1951	1,749	47
Barley		
1971	386	54
1966	265	42
1961	78	43
1956	105	35
1951	194	38
Grain corn		
1971	1,263	81
1966	786	82
1961	396	74
1956	502	55
1951	289	55

Appendix Table 9.— Trends in Number of Grain Consuming Animals and Animal Units by Census Years, Ontario, 1951-1971[1/]

	1951	1956	1961	1966	1971
Swine, 6 mos. & over					
Number, 000's	332	265	328	394	426
Animal units, no.	99,900	79,500	98,400	118,200	127,800
Swine, under 6 mos.					
Number, 000's	1,423	1,283	1,359	1,541	1,931
Animal units, no.	142,300	128,300	135,900	154,100	193,100
Hens & pullets kept for laying, 6 mos. & over					
Number, 000's	6,839	7,699	8,941	8,486	10,902
Animal units, no.	68,390	76,990	89,410	84,860	109,020
Pullets intended for laying, 2-6 mos.					
Number, 000's	7,710	5,687	3,559	2,672	4,758
Animal units, no.	23,130	17,061	10,677	8,016	14,274
All other chickens not intended for laying, over 2 months					
Number, 000's	3,809	2,365	1,366	1,442	884
Animal units, no.	19,045	11,825	6,830	7,210	4,420
Chicks less than 2 months					
Number, 000's	5,409	9,183	10,842	12,708	14,968
Animal units, no.	7,572	12,855	15,178	17,791	20,955
Turkeys					
Number, 000's	667	1,415	2,746	4,045	3,765
Animal units, no.	26,680	56,600	109,840	161,800	150,560
Ducks					
Number, 000's	166	124	122	136	155
Animal units, no.	1,660	1,240	1,220	1,360	1,550
Geese					
Number, 000's	139	95	71	61	74
Animal units, no.	1,390	950	710	610	740
Total animal units, no.	390,067	385,321	468,165	553,947	622,419

Appendix

Table 10—Acreage and Production of Principal Crops in the COLUC Area, 1951 and 1971

	ACREAGE			PRODUCTION		
	1951	1971	Percentage change 1951—1971	1951	1971	Percentage change 1951—1971
	acres		%	tons		%
Forage						
Hay	313,185	236,751	- 24.4	739,629	641,538	- 13.3
Corn silage	30,441	48,110	+ 58.0	288,052	621,867	+115.9
				bushels		
Cereal Grains						
Oats	174,825	61,697	- 64.7	9,046,242	3,881,638	- 57.1
Barley	13,498	53,214	+294.2	524,814	3,006,942	+472.9
Mixed grain	116,271	83,382	- 28.3	6,146,005	5,238,425	- 14.8
Buckwheat	9,324	--	--	96,925	--	--
Spring wheat	4,535	--	--	93,975	--	--
Winter wheat	114,329	35,861	- 68.6	3,073,488	1,465,911	- 52.3
Grain corn	5,492	69,058	+1,157.4	294,199	5,474,343	+1,760.7
Fall rye	7,365	1,185	- 83.9	142,205	31,995	- 77.5
Other Crops						
Flax	1,132	6	- 99.5	15,141	102	- 99.3
Soybeans	775	1,636	+111.1	14,587	44,172	+202.8
Dry peas	342	--	--	6,514	--	--
Dry beans	242	268	+ 10.7	4,374	4,735	+ 8.2
Potatoes	8,416	5,725	- 32.0	1,345,579	1,680,243	+ 24.9
				$ values		
Vegetables	15,086	17,951	+ 19.0	3,117,757	8,778,968	+181.6
Fruits	23,864	11,411	- 52.2	3,577,726	5,966,502	+ 66.8

Source: Agricultural Statistics, Publication #20, OMAF.

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